

CERES Data Management System

Items for Discussion - December, 1995

Organization

Schedules - long term and near term

Science software development process

Working Group status - Subsystem development

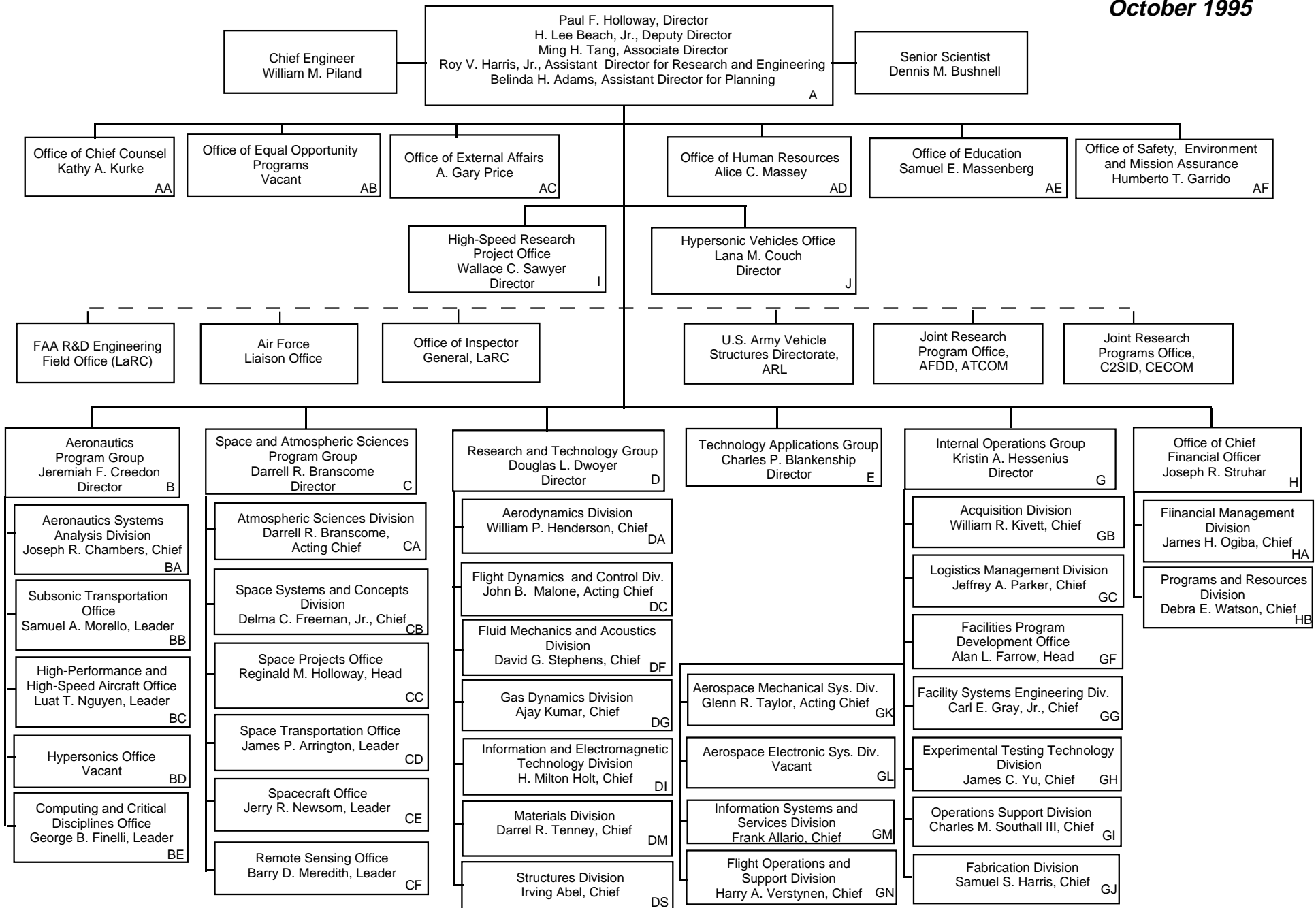
Science Computing Facility status

Some metrics - data and code

Issues for discussion

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Data Management Office
Atmospheric Sciences Division
Langley Research Center

LANGLEY RESEARCH CENTER
Organization Chart
October 1995



NOTE: Alpha letter(s) in lower right corner of box denote(s) organizational code.

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JoAnn Hudgins	42968

Atmospheric Sciences Division 45380 M/S 401 CA Fax: 48197	
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E. E. Kornegay, Secretary	46606
A. G. Allen, AO	48630

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A. W. Reid, Sec.	45386
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J. J. Chapman	44833
B. A. Childers	44620
P. K. Costulis	41943
J. C. Currey	44691
M. T. Ferebee	45617
E. B. Geier	41854
R. L. Huffman, Jr	46083
C. E. Mackey	47464
M. V. Mitchum	47034
M. C. Shipham	45618

**ERBE /SAGE II Mission
CERES Data Management**

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E. V. Browell	41273
V. S. Connors	45849
E. Conway	41435
R. J. DeYoung	41472
W. B. Grant	45846
N. S. Higdon	45367
S. Ismail	42719
A. M. Larar	45328
J. R. Olson	45327
J. H. Park	45811
C. P. Rinsland	42699
M. A. H. Smith	42701
H. A. Wallio	45366

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T. J. Reavis, Sec.	45690
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G. D. Considine	45805
L. E. Deaver	45696
R. S. Eckman	45822
M. M. Kleb	45816
J. S. Levine	45692
M. G. Mlynczak	45695
R. B. Pierce	45817
E. E. Remsberg	45823
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HALOE

AEROSOL RESEARCH BR. 42669, M/S 475 CAE Fax : 42671	
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M. E. Kopia, Sec.	48527
J. M. Alvarez	42677
W. P. Chu	42675
G. L. Maddrea, Jr.	42674
L. W. Thomason	46842
Lelia Vann	49356
D. M. Winker	46747
D. C. Woods	42672
O. Youngbluth, Jr.	45332
G. K. Yue	42678
J. M. Zawodny	42681

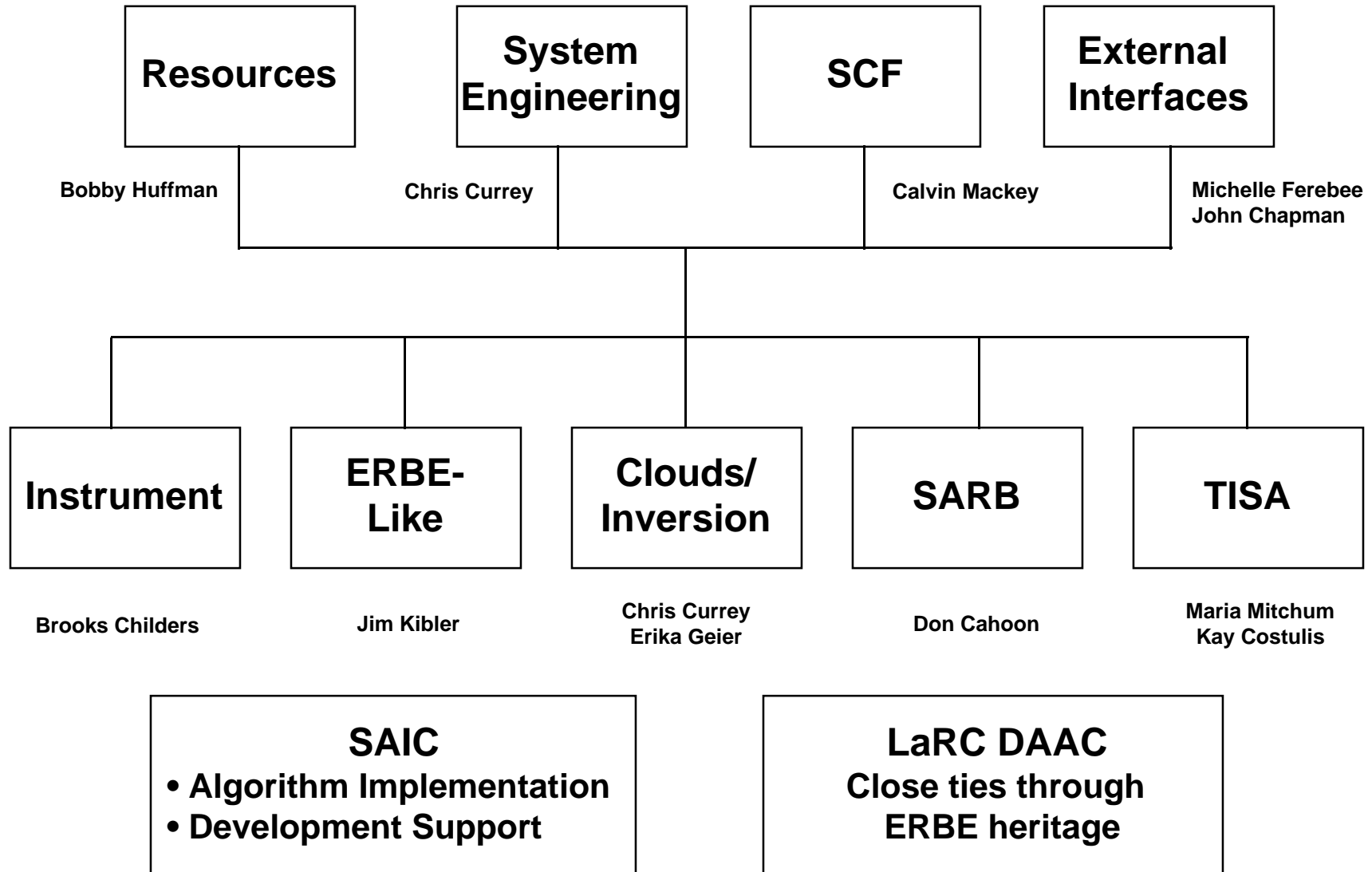
SAGE III

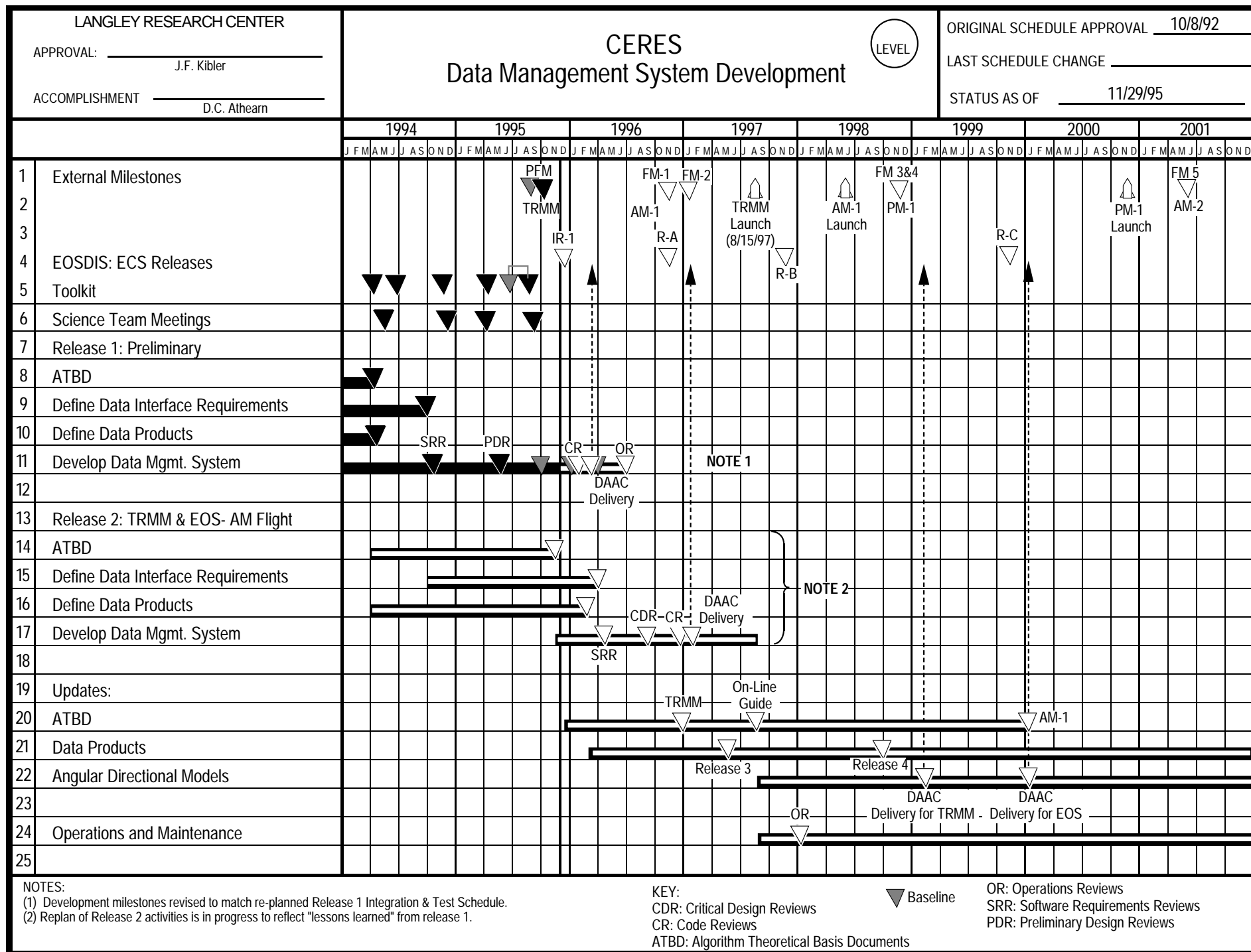
RADIATION SCIENCES BR. 45665, M/S 420 CAF FAX: 47996	
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A. Carlson	47050
J. M. Hubble, Sec.	48333
S. German	45664
B. R. Barkstrom	45676
B. A. Baum	45670
T. C. Bess	45686
L. H. Chambers	44371
T. P. Charlock	45687
R. N. Green	45684
D. P. Kratz	45669
R. B. Lee III	45679
P. Minnis	45671
G. L. Schuster	41486
G. L. Smith	45678
C. H. Whitlock	45675
T. Wong	45607

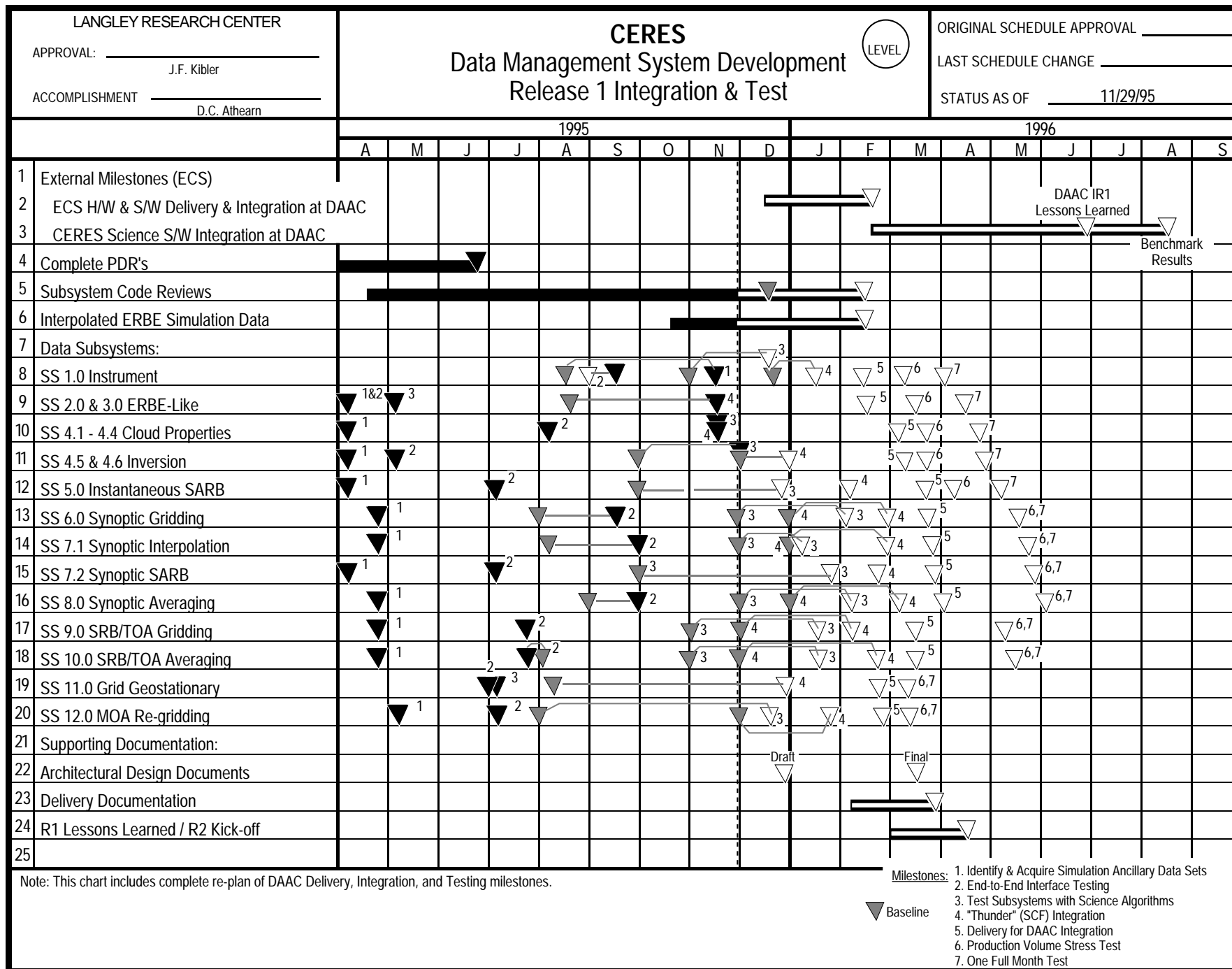
CERES Science

ATMOSPHERIC STUDIES BR 45828, M/S 483 CAG Fax: 45841	
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W. R. Cofer III	45835
G. L. Gregory	45834
D. S. McDougal	45832
G. C. Purgold	45844
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J. A. Ritter	45693
A. D. Scott	44430
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H. A. Wallio	45366

CERES Data Management System Functions







Science Software Development and Testing

Requirements - Specify what we have to build

- **ATBD's - Define science algorithm theoretical basis**
- **Data Product Catalog - Content of each archival and intermediate data product**
- **SRD's - Software Requirements Document - More specifics on input/process/output**

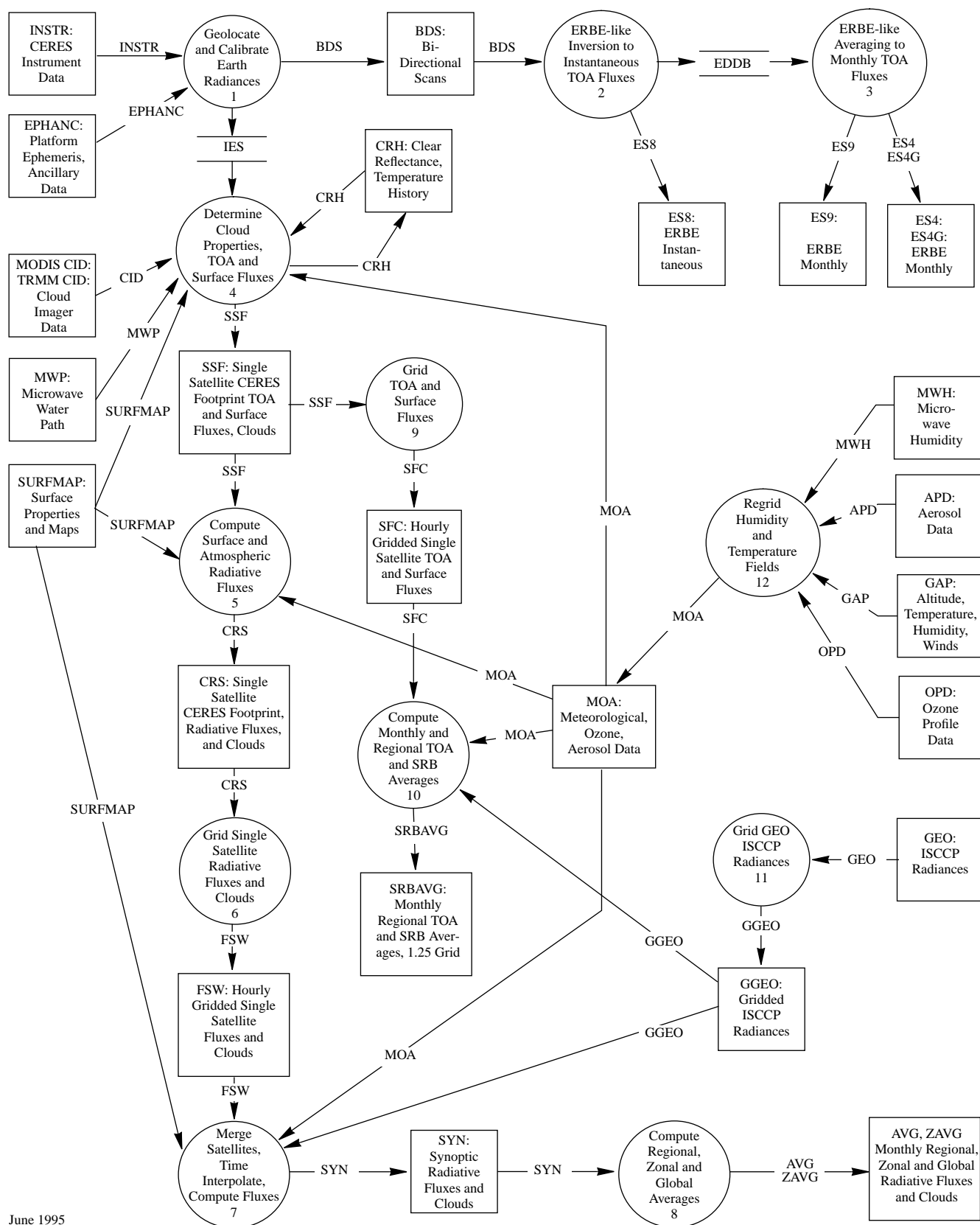
Design/Implementation/Test - These are the phases we're in now. Example products:

- **Data flow diagrams - describe relationships between major processes and data products**
- **Context diagrams - specify control flow and data flow interactions**
- **Structure charts - functional decomposition at successive levels of detail**
- **Code - implements ideas expressed in all of the above**

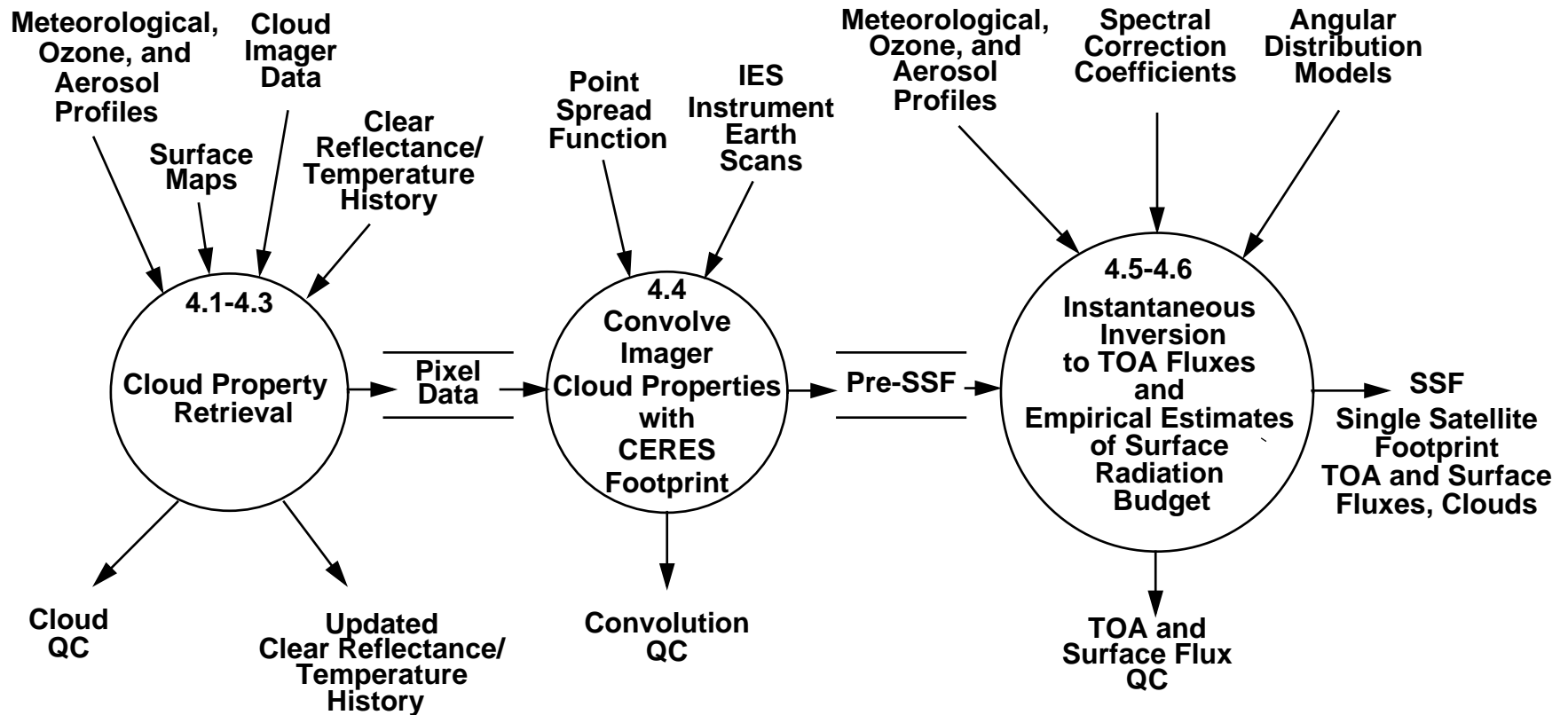
Testing scenario

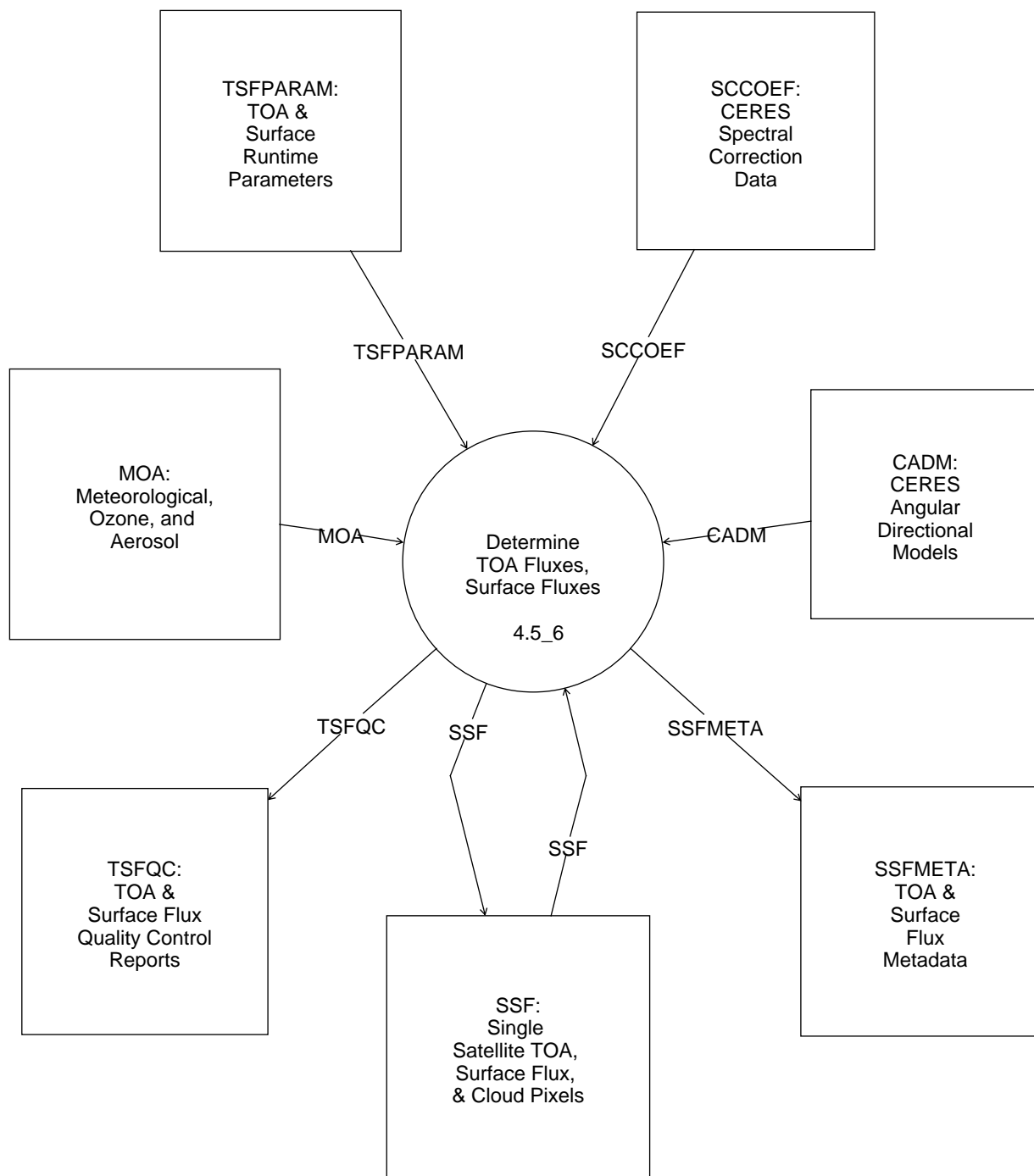
- **Using October, 1986 as the month for focusing test results**
- **ERBE scanner on NOAA 9 simulates CERES data**
 - **Initially using only longwave and shortwave channels with ERBE sampling**
 - **Later will include higher CERES sampling rate, different scan pattern, window channel**
- **AVHRR on NOAA 9 simulates TRMM VIRS imager for cloud properties**
- **Simulate ancillary data products from research and production sources:**
 - **ISCCP B3 geostationary visible and infrared**
 - **SAGE water vapor**
 - **Pinker (U. Md) and Stowe (NOAA) aerosol**
 - **NMC gridded temperature and humidity**
 - **TOMS ozone**
 - **Navy 10 minute maps of elevation, land/water percentage, terrain type**
 - **EPA 10 minute map of ecosystem surface type**

CERES Top Level Data Flow Diagram



Cloud Subsystem Decomposition





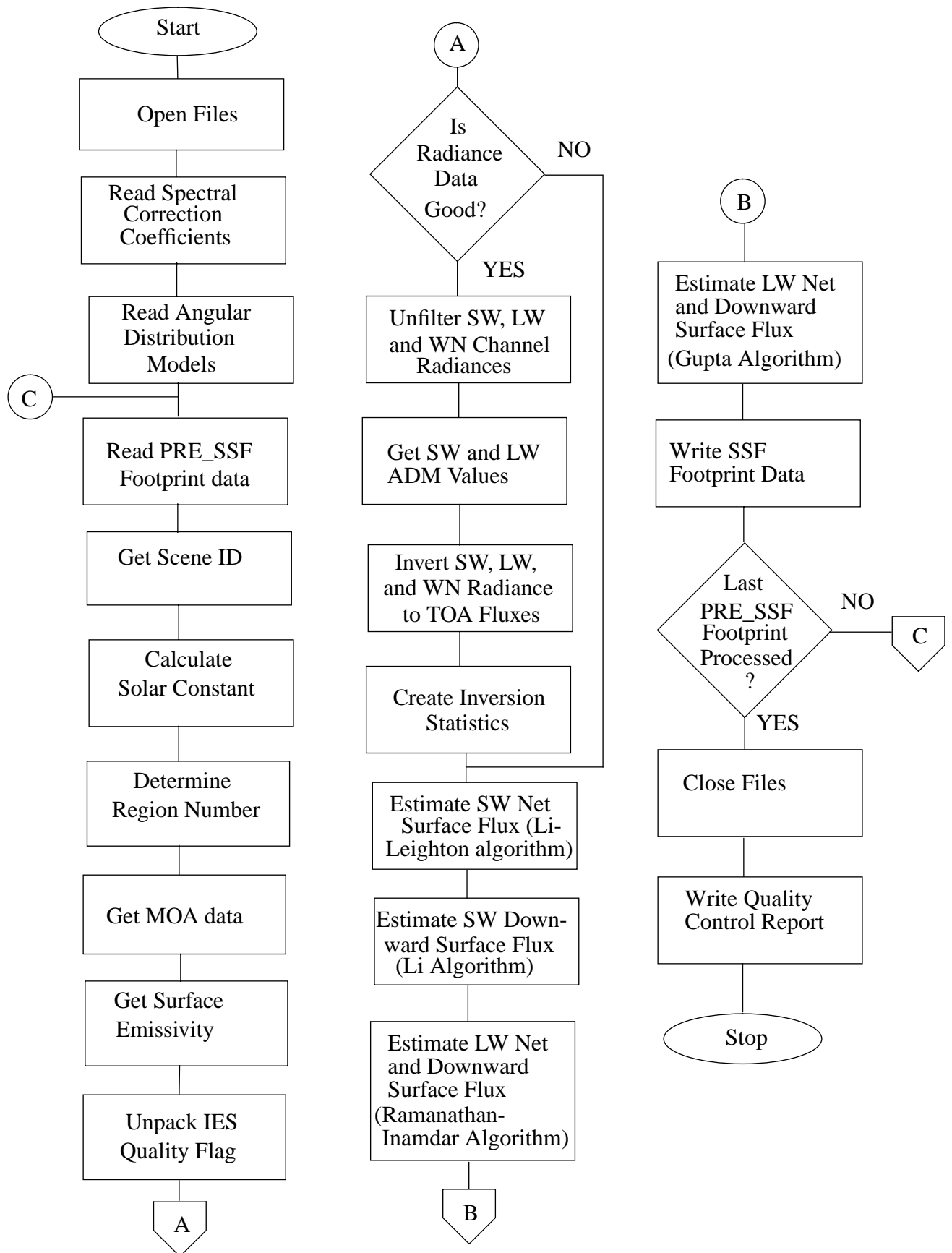


Figure 2-2. CERES TOA and Surface Fluxes Processing Flow

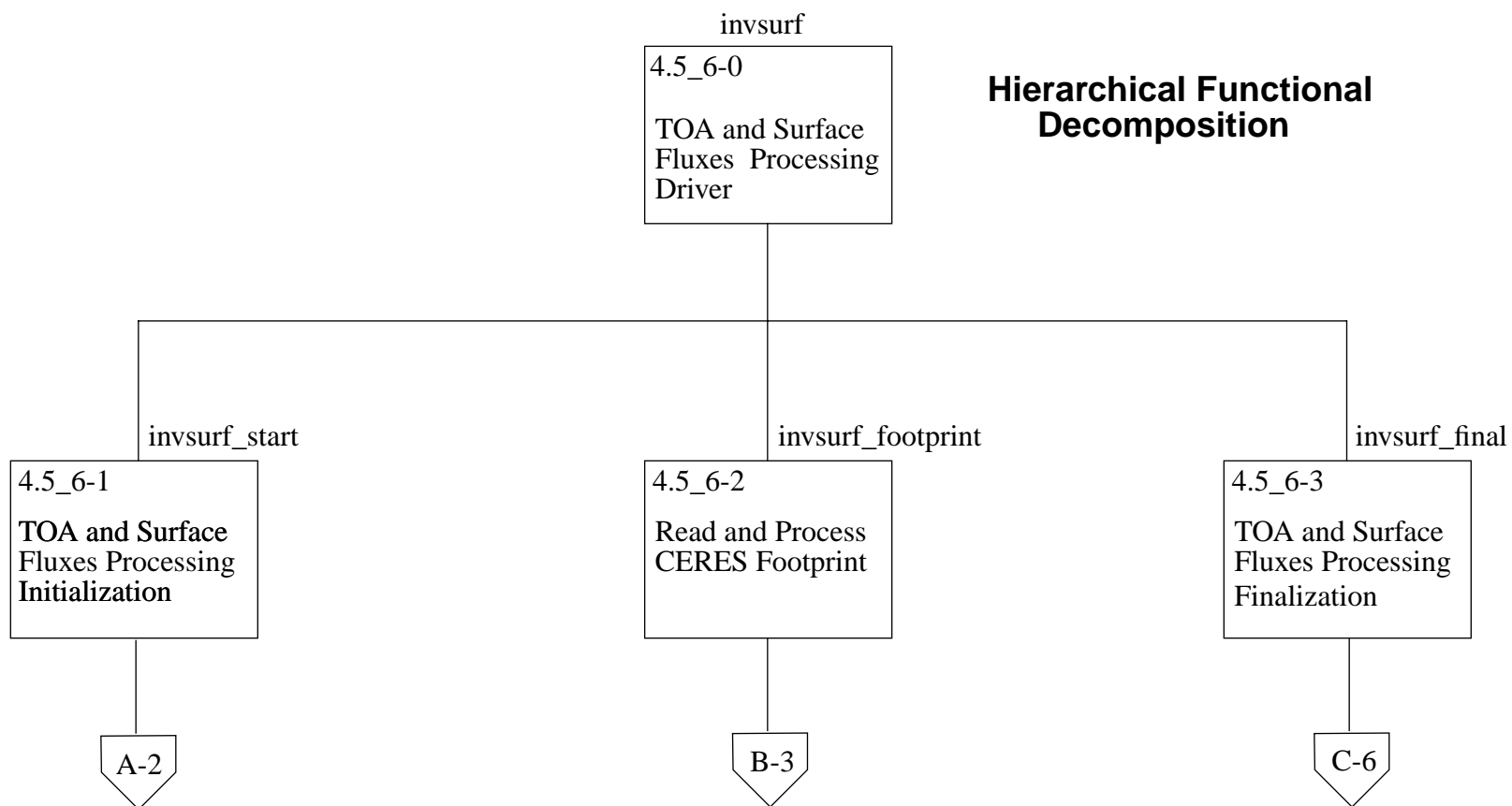


Figure 2-1. CERES TOA and Surface Fluxes Processing Functional Structure Chart (1 of 6)

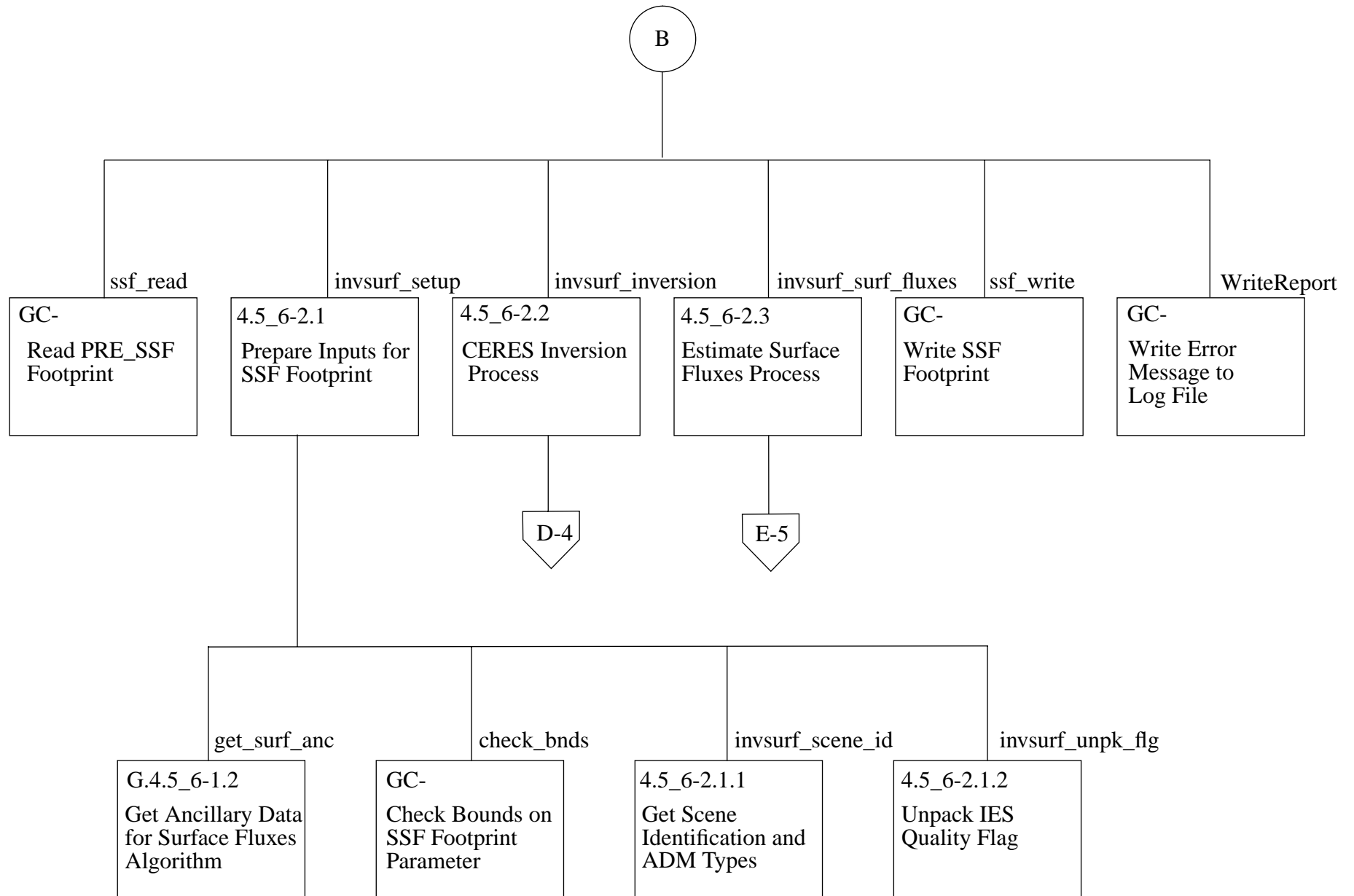


Figure 2-1. CERES TOA and Surface Fluxes Processing Functional Structure Chart (3 of 6)

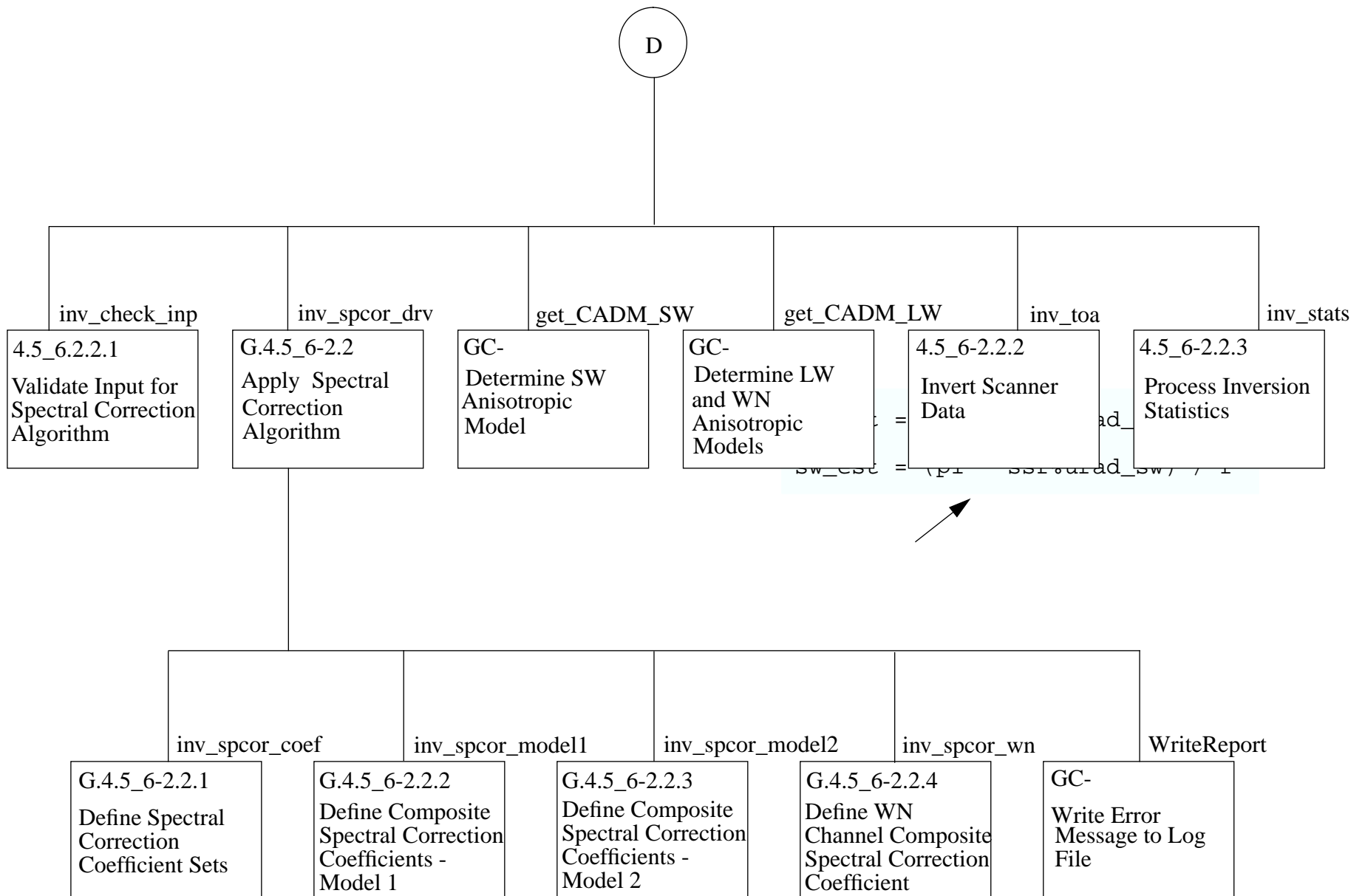


Figure 2-1. CERES TOA and Surface Fluxes Processing Functional Structure Chart (4 of 6)

Location: <http://asd-www.larc.nasa.gov/ceres/docs.html>



[What's New](#) [What's Cool](#) [Handbook](#) [Net Search](#) [Net Directory](#) [Newsgroups](#)



CERES On-Line Documentation

- [Algorithm Theoretical Basis Documents](#)
- [Configuration Management Plan](#)
- [Data Management Plan](#)
- [Data Products Catalog](#)
- [Interface Requirements Document](#)
- [Software Coding Guidelines](#)
- [Software Computer Bulletins](#)
- [Software Requirements Documents](#)
- [CERESlib](#)



[ASD Home Page](#)

Last Updated Monday, November 6, 1995, 9:00 EST

Web Curator: P. Kay Costulis (p.k.costulis@larc.nasa.gov)

Development Activities

System Requirements Documents

- **Software specifications derived from ATBD's**
- **Published in 13 volumes on web server**

Preliminary Design Reviews

- **Seven informal working group reviews held from 12/94 - 6/95**
- **Presentations and minutes captured as working documents**

Implementation

- **Coding guidelines published for some measure of consistent common sense**
- **Code walkthroughs of focused modules ongoing since 4/95 and will continue**
- **Computer bulletins (17 so far) to share standard practices, tips, and experiences**
- **CERESlib utilities for common functions across all subsystems**
 - **Includes module to isolate machine dependencies such as word sizes**
 - **Standard access routines for each archival data product (not HDF in Release 1)**

Integration and Testing

- **Set up SCF target environment (Thunder) to model DAAC configuration**
- **Porting from SCF development workstations to Thunder**
- **Close interaction with Science Team to review results every step of the way**

External Interfaces and Mission Operations

Responsible for:

- **Negotiations with GSFC EOS and TRMM Projects**
- **Coordination with Langley CERES Project Office and TRW**
- **TRMM & EOS Instrument monitoring, real time displays, instrument health & status**
- **Software to distribute/analyze H/K data from TRMM IST to LaRC SCF**

TRMM:

- **GSFC has agreed to develop software for automatic generation of command loads**
- **Secure data line from GSFC to LaRC for real-time displays is in place**
- **LaRC was ready to perform connectivity test initially scheduled for September, 1995**
- **Now switching to Unix-based terminal to run Xforward security software**
- **Method defined to distribute real-time H/K displays to multiple terminals without violating NASCOM security rules**
- **Selecting software package for analysis and graphical display of H/K data**

EOS-AM:

- **Participated in EOSDIS Core System Flight Operations Segment Critical Design Review, October 1995**
- **Submitted planning aid and operations requirements to EOS-AM flight operations personnel**

Near-term Plans:

- **Test transmission of H/K displays and planning aids between TRMM MOC and LaRC**
- **Continue evaluation of TRW GSE software for analyzing TRMM H/K data**
- **Continue to work flight operations details with TRMM and EOS-AM personnel**

CERES Instrument Simulator

Processor simulation for validation of re-programming and in-flight anomaly investigation

- **Presented Preliminary Design Workshop - 1/31/95**
- **Presented Simulator Concept at GSFC Quarterly Review (at LaRC) - 2/16/95**
- **Matlab/Simulink CERES scanner m-files imported for simulator from engineering group (7/95)**

Current Status:

- **Host upgraded to 120 MHz Pentium**
- **Host-PC cards: 1553 I/O cards now installed in host PC**
- **Host-PC software: Matlab/Simulink now installed on Pentium with TRW software**
- **TRW circuit cards from Cirtech: Fully socketed & awaiting SRAM memory adapter cards**
- **Chips to populate TRW cards: Ready for installation once cards have been interconnected**
- **Simulator hardware is being assembled in Bldg. 1250**
- **PC - 486 for spacecraft interface (1553 link) needs memory upgrade**
- **CAD files to drive visual display of instrument model received from TRW**

Near-term Plans:

- **Hardware integration**
- **Card interconnection**
- **System checking and testing**

Working Group: Instrument

Responsible for:

- **Subsystem 1 (Instrument Geolocate and Calibrate Earth Radiances)**

Data Products:

- **BDS (Bi-Directional Scan)**
- **IES (Instrument Earth Scan)**

Current Status:

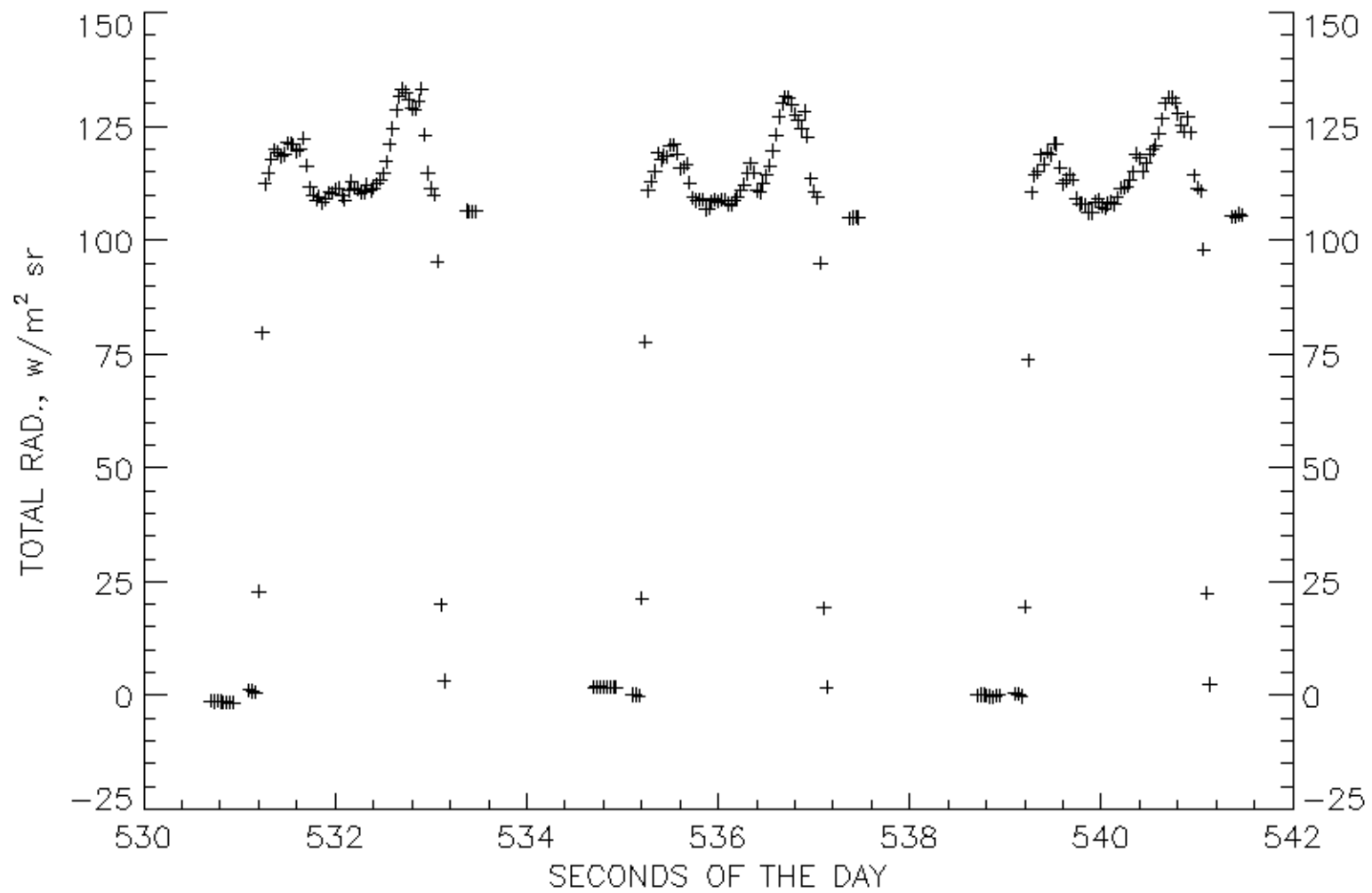
- **Completing code for geolocation and radiometric conversions**
- **Incorporated TRW Calibration Chamber data into a Level 0 file for testing**
- **Started port of code to Thunder for integration testing**
- **Using ECS Toolkit Release 5 (latest version)**
- **Started design and coding of Build 4 software items (Production Report module)**

Near-term Plans:

- **Complete integration testing of Build 3 software using TRW and ERBE Level 0 test files**
- **Complete design, coding and testing of Build 4 modules**
- **Complete port of Builds 1, 2, and 3 to Thunder; begin integration testing on Thunder**
- **Interpolating and formatting ERBE data into a Level 0 file for testing**

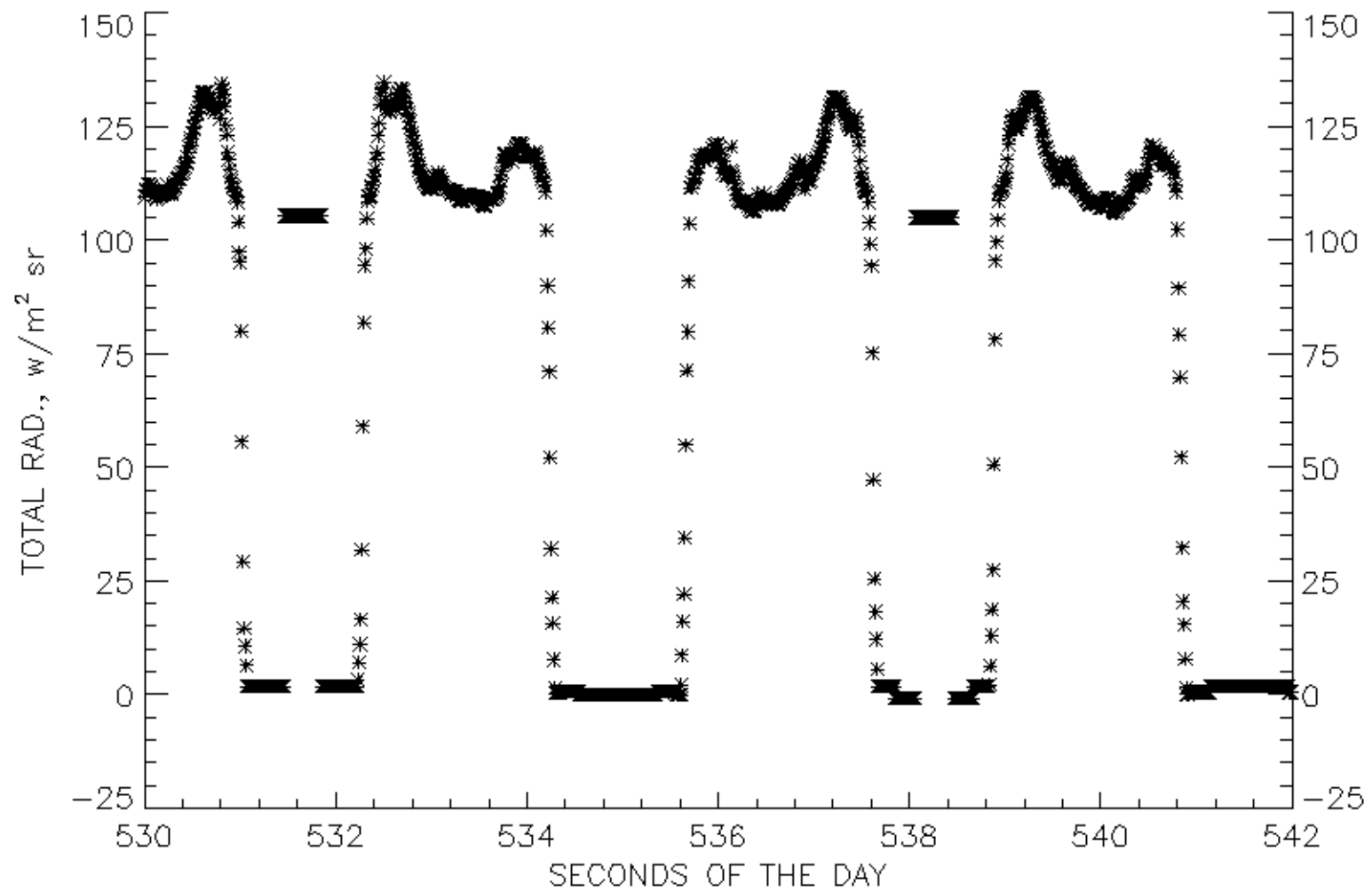
ERBE Scanner Measurements

NOAA-9 861001 (ERBE)



ERBE Interpolated to CERES Characteristics

NOAA-9 861001 (CERES)



Working Group: ERBE-Like

Responsible for:

- **Subsystem 2 (ERBE-like Inversion to Instantaneous TOA Fluxes)**
- **Subsystem 3 (ERBE-like Averaging to Monthly TOA Fluxes)**

Data Products:

- **ES-8 (Equivalent to ERBE Instantaneous TOA Estimates)**
- **ES-9 (Monthly Averaged Regional Parameters)**
- **ES-4, ES-4G (Monthly Averaged Regional, Zonal, Global Parameters by region and gridded)**
- **Scene ID Ancillary Input Data, Spectral Correction Ancillary Input Data**
- **Solar Declination values for each year, Albedo Directional Model values**

Current Status:

- **All ERBE-like code has been successfully ported to “thunder” and runs in 32-bit mode with the Nag Fortran 90 compiler and in 64-bit mode with the SGI Fortran 90 compiler, both using the Toolkit.**

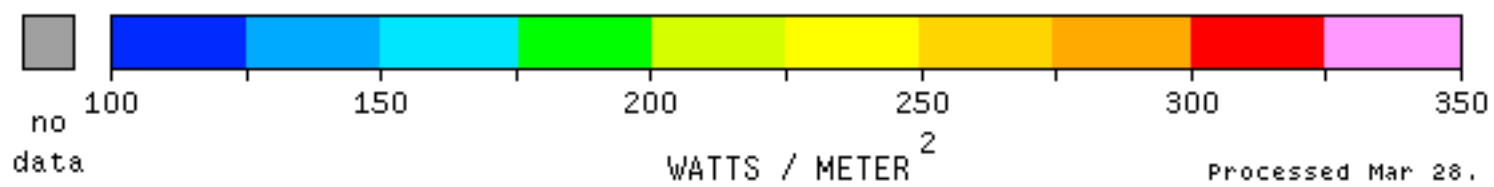
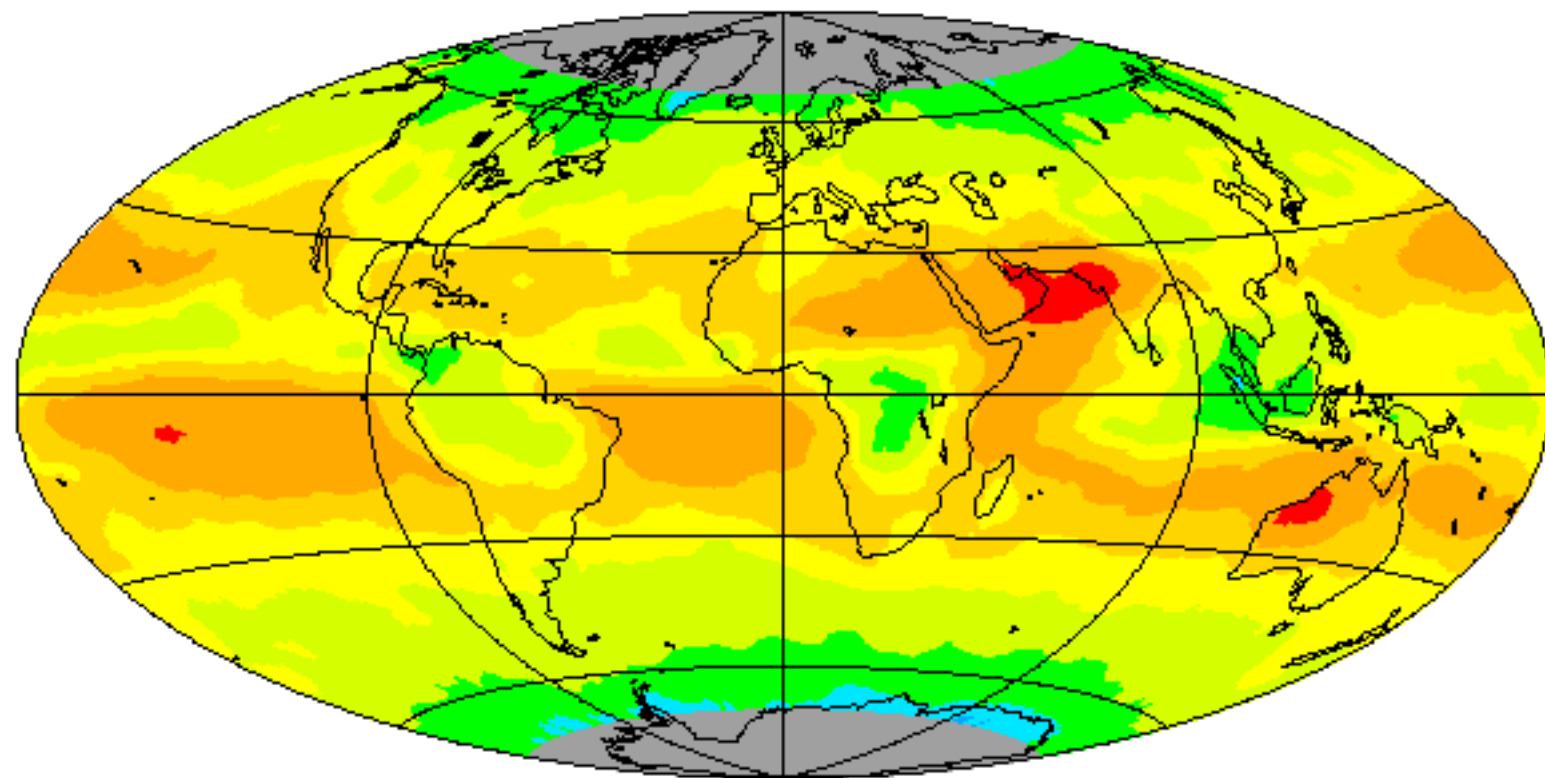
Challenge:

- **How to handle latest standard grid decision - maintain compatibility with old ERBE 2.5 degree equal-angle data sets versus new EOS 1.25 degree equal-area representation**

Near-term Plans:

- **Complete the Release 1 Delivery Document for the ERBE-like Subsystems (2.0 and 3.0)**
- **Complete the Subsystem 2.0 and 3.0 Reference Manuals.**

LONGWAVE RADIATION
ERBS, 2.5 DEG SCANNER
OCTOBER 1986



Processed Mar 28, 1989

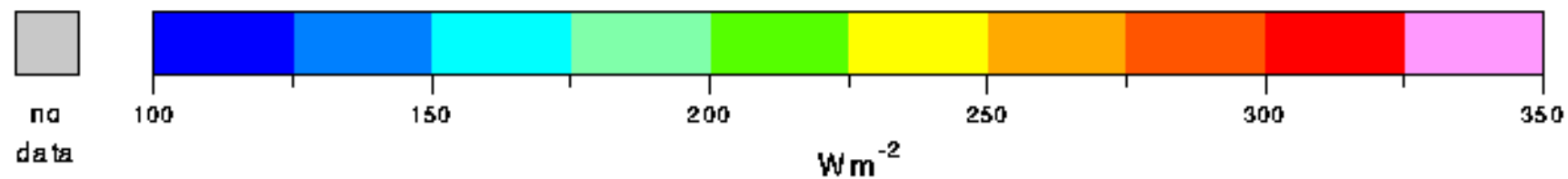
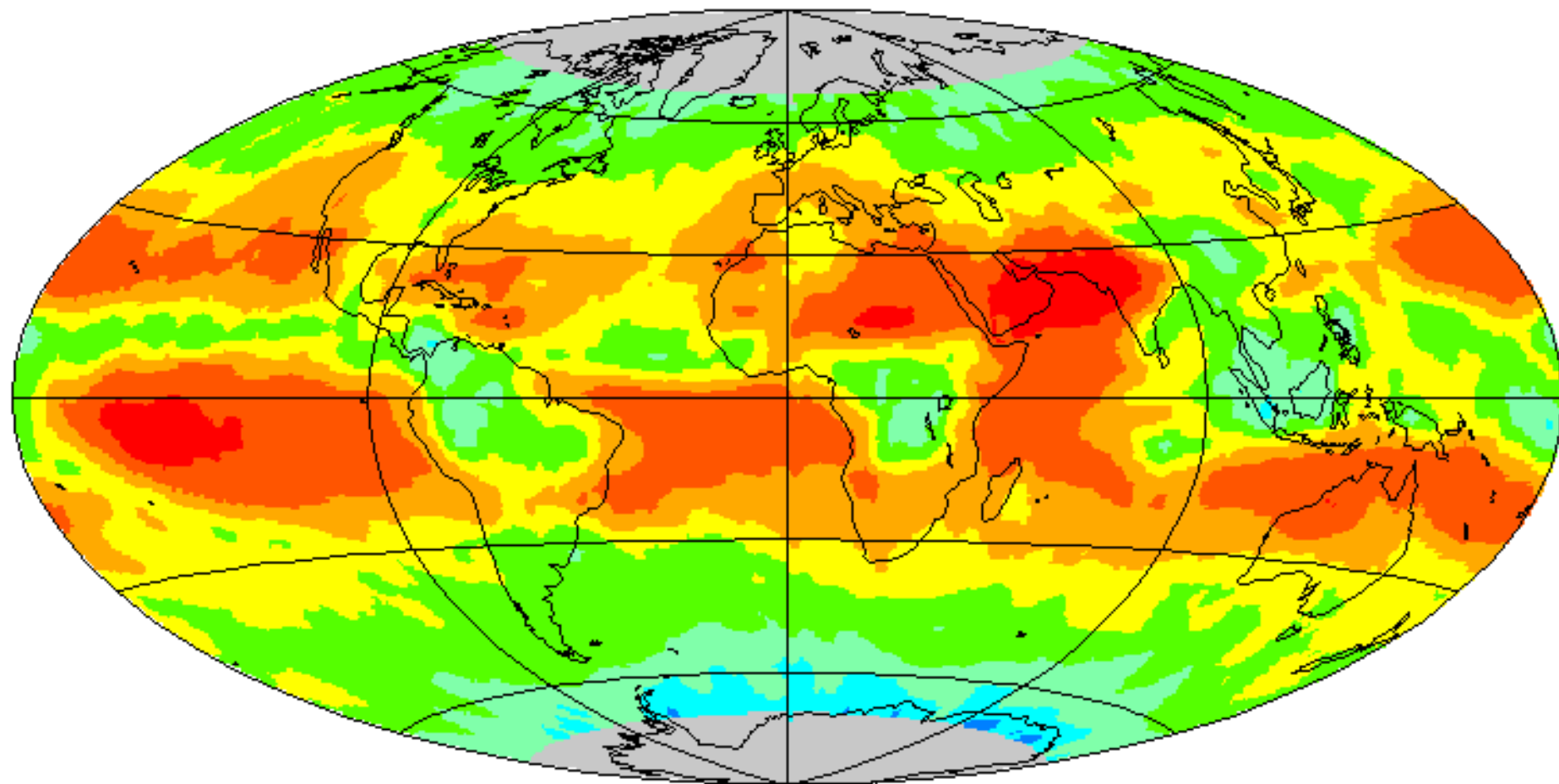
Longwave Radiation from CERES ERBE-Like Processing

ERBS October 1986

ProcDate: Dec 7 1995

2.5 Deg Region Scanner

Monthly Mean (Hour)



Working Group: Clouds

Responsible for:

- **Subsystem 4.1 - 4.3 (Clear/Cloud Detection, Cloud Layers, Optical Properties)**
- **Subsystem 4.4 (Convolution with CERES Footprint)**

Data Products:

- **SURFMAP (Surface Map and Properties)**
- **VIRS & MODIS & AVHRR (Cloud Imager Data)**
- **CRH (Clear Reflectance/Temperature History)**
- **CookieDough, CloudVal, FOOTPRINTVal**
- **Intermediate SSF (Single Satellite Footprint, TOA and Surface Flux, Clouds)**

Current Status:

- **F90 Production code running on SCF SGI in 32 bit mode, Irix 6.1**
- **All Release 1 Science Algorithms Integrated:**

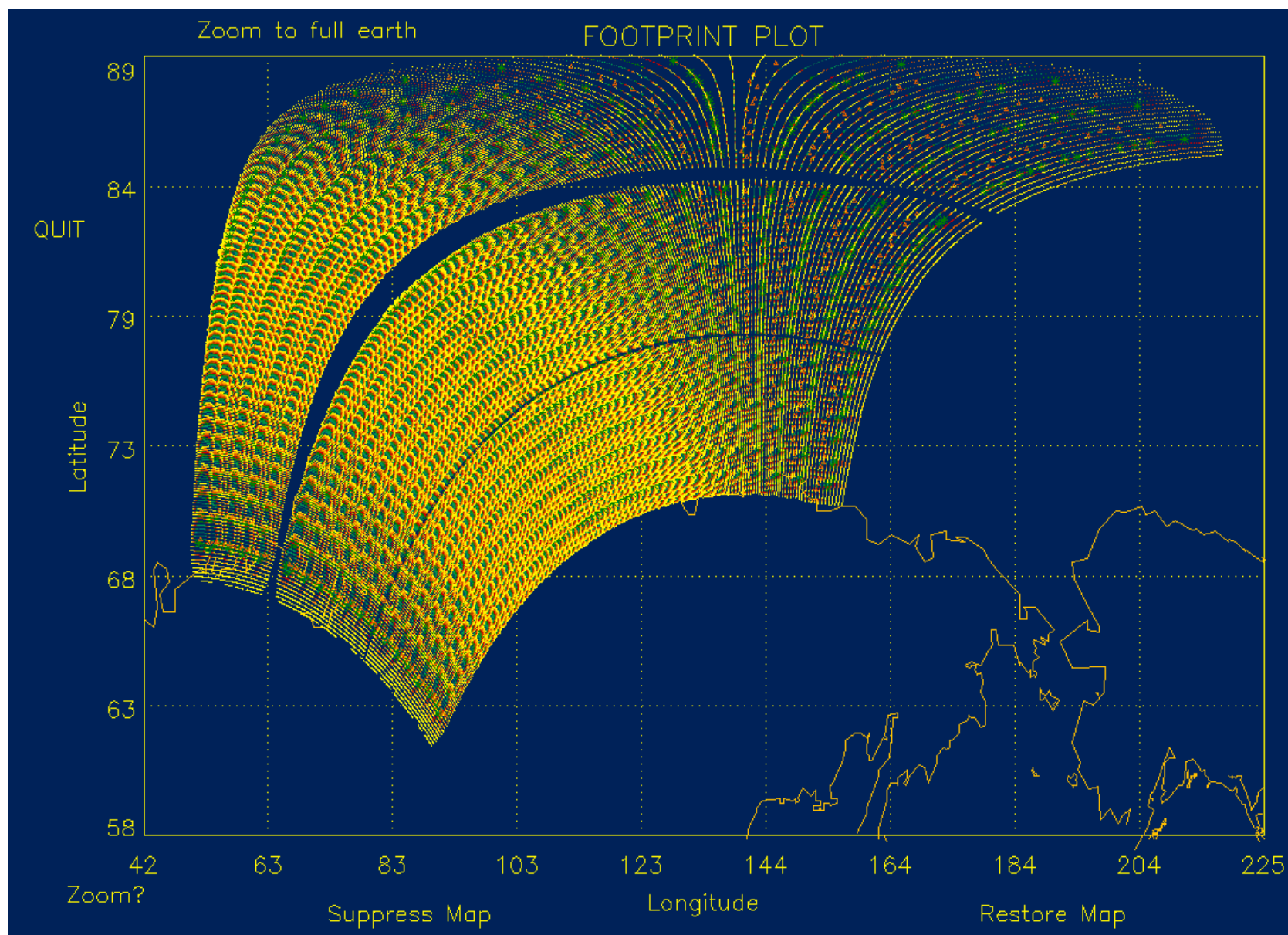
CERES cloud mask - Welch, Baum
AI cloud classification - Baum
Cloud layers - Coakley

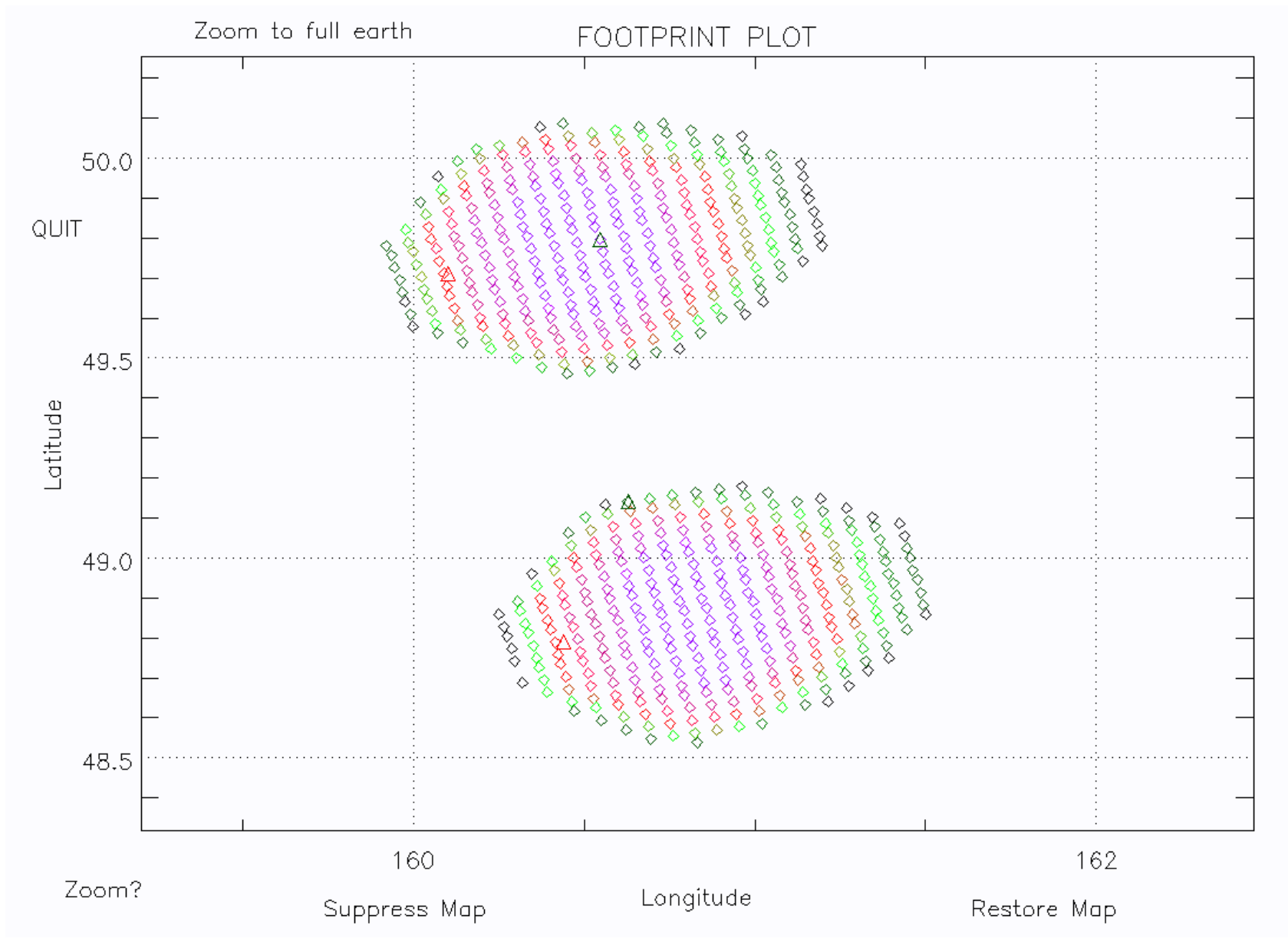
Aerosol optical depth - Stowe
Water droplet cloud properties - Platnick
Microphysical and optical properties - Minnis

- **Tested with 24 hours of October '86 data**

Near-term Plans:

- **IR-1 Integration**
- **Support NASA Pathfinder Program - Global layered cloud systems**





Working Group: Inversion and Surface Estimation

Responsible for:

- **Subsystem 4.5 (CERES Inversion to Instantaneous TOA Fluxes)**
- **Subsystem 4.6 (Estimate Longwave and Shortwave Surface Radiation Budget)**

Data Product:

- **Archival SSF (Single Satellite Footprint, TOA and Surface Flux, Clouds)**

Current Status:

- **Release 1 software coded**
- **Architectural Design Document Draft for Release 1 software in internal review**
- **Release 1 software tested in current environment**
- **Release 1 software uses toolkit but SSF not written in HDF**

Near-term Plans:

- **Complete testing of software on SGI**
- **Modify Surface Estimation modules so they can also be used by TISA**
- **Switch over to most recent SSF definition**

Comparison of Inversion Fluxes

- **Developed tools to compare Top-of-Atmosphere Inversion results**
- **Can compare S-8 (ERBE) fluxes and SSF (CERES) fluxes**
- **Same footprints; same radiances**
- **Will add comparisons with ES-8 (ERBE-like) and Window channel fluxes**

In this example:

- **October 1, 1986 hour 5 NOAA-9 data; 60° Latitude Range; Daytime**
- **Same Angular Direction Models**
- **Different Scene ID: ERBE - Maximum Likelihood Estimator using ERBE data only
CERES - Cloud properties derived from AVHRR imager data**
- **Different Geomap: ERBE - 2.5 deg region
CERES - 10 min region**
- **Can also obtain Longwave flux statistics**

Comparison of ERBE and CERES Inversion (by Scenes)

Shortwave Flux Differences (CERES -ERBE)

	ERBE Inversion					
CERES Inver- sion		Clear	PC	MC	OV	
	Clear	mean stdev num	2.05 7.40 2834	8.74 21.62 850	20.76 67.41 9	50.99 218.05 21
	PC	mean stdev num	-5.18 18.19 926	0.20 5.71 3858	12.58 26.10 729	51.15 89.43 227
	MC	mean stdev num	-3.82 24.49 43	-6.92 15.41 1350	0.38 3.15 3063	6.58 23.08 1334
	OV	mean stdev num	10.94 9.82 8	-27.69 19.94 25	-11.38 14.44 1222	0.42 0.24 2500

Overall Shortwave mean=0.962 std. dev.=18.89 number=18999

Working Group: SARB - Surface and Atmospheric Radiation Budget

Responsible for:

- Subsystem 5 (Compute Surface and Atmospheric Fluxes)
- Subsystem 7.2 (Synoptic Flux Computation)
- Subsystem 12 (Regrid Humidity and Temperature Fields (NMC))

Data Products:

- CRS (Single Satellite Footprint, and Radiative Fluxes and Clouds)
- SYN (Synoptic Radiative Fluxes and Clouds)
- MOA (Meteorological, Ozone, and Aerosol)
- MWH, APD, GAP, OPD External Ancillary Data Inputs

Current Status:

- All subsystems are in the coding and testing phase of development
- Converting NMC temperature and humidity data to conform with CERES grid in Subsystem 12.
- Incorporating SAGE water vapor climatology, for humidity profile values above 300 mb

Challenges:

- Sun workstation internal memory usage by Subsystem 12. Currently testing on Thunder (SGI R8000).
- NMC humidity data above 300 hPa is suspect

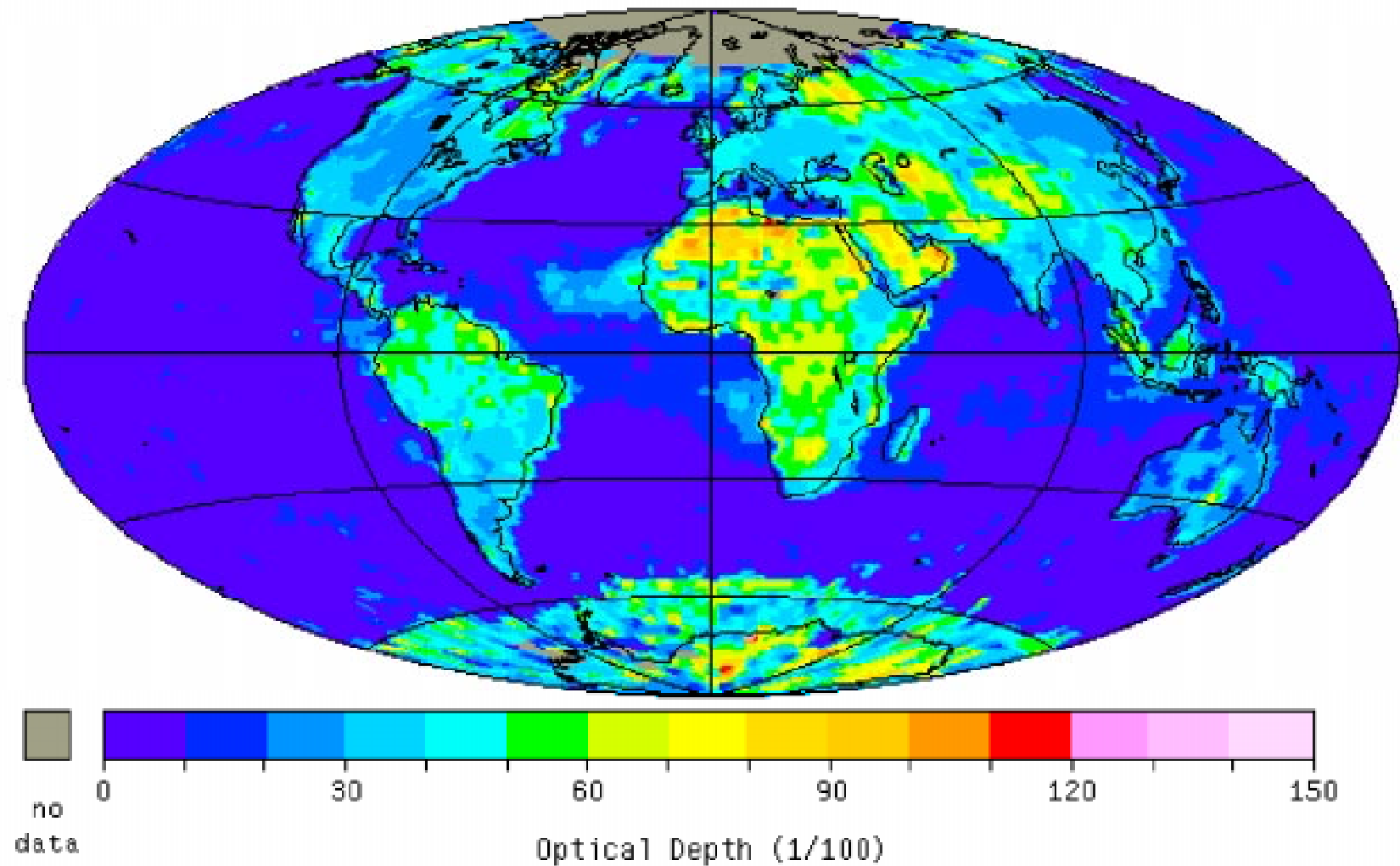
Near-term Plans:

- Incorporate radiative transfer code provided by Drs. Fu and Liou into Subsystems 5 and 7.2.
- Complete architectural design documents.
- Integration of Subsystem 5.0 and 12 to Thunder

MOA Monthly Aerosol

October, 1986

Combined Pinker and Stowe Products



1.25 Degree Equal Area

Working Group: TISA - Time Interpolation and Spatial Averaging

Responsible for:

- **Subsystem 6 (Hourly Gridded Single Satellite Fluxes and Clouds)**
- **Subsystem 7.1 (Time Interpolation for Single and Multiple Satellites)**
- **Subsystem 8 (Compute Regional, Zonal and Global Averages)**
- **Subsystem 9 (Grid TOA and Surface Fluxes)**
- **Subsystem 10 (Compute Monthly and Regional TOA and SRB Averages)**
- **Subsystem 11 (Grid Geostationary Data)**

Data Products:

- **FSW - Hourly Gridded Single Satellite Fluxes and Clouds (Subsystem 6)**
- **SYN - Synoptic Radiative Fluxes and Clouds (Subsystem 7)**
- **AVG, ZAVG - Monthly Regional, Zonal and Global Radiative Fluxes and Clouds (Subsystem 8)**
- **SFC - Hourly Gridded Single Satellite TOA and Surface Fluxes (Subsystem 9)**
- **SRBAVG - Monthly Regional TOA and SRB Average, 1.25 Grid (Subsystem 10)**
- **GGEO - Gridded ISCCP Geostationary Data (Subsystem 11)**

Current Status:

- **Porting and testing all subsystems software (except ss7.1 and ss8) on SCF**
- **Drafting Architectural Design Documents**

Near-Term Plans:

- **Add Quality Control Report features to all subsystems.**
- **Add footprint smoothing algorithm to Gridding subsystems (ss6 and ss9)**
- **Construct 744 hourly sample data sets of geophysical properties from ERBE Oct. 86 data for geometry testing**
- **Add Cess-Ramanathan surface flux algorithms to Averaging subsystems**
- **Redesign ss10 code to create ss7.1 and ss8**
- **Modify Gridding subsystem (ss9) code from GMT time to 'local' time**

Challenge:

- **How will the hourly (744) files be staged to execute one month for ss6 and ss9?**

File 1

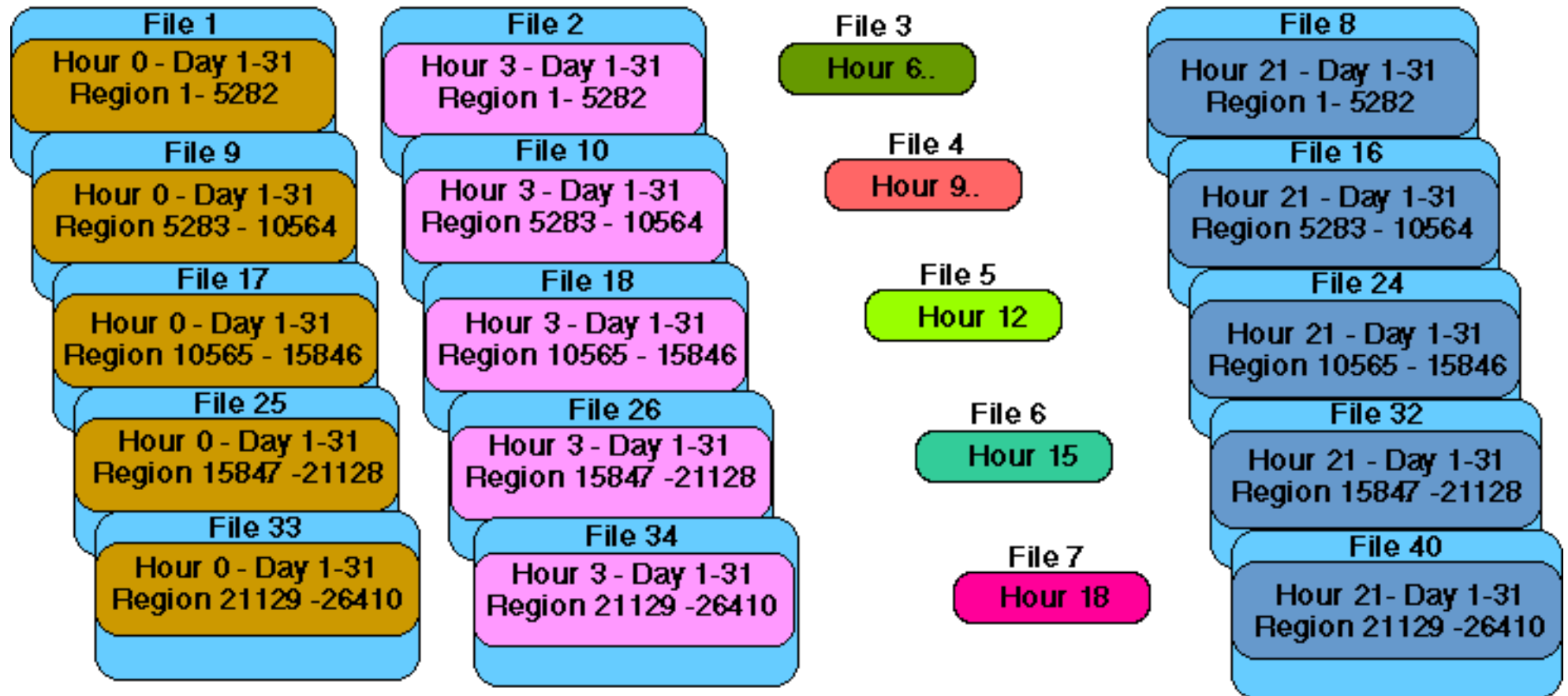
Table 1: Simplified TSI file

Record	Region	Hour	Date	Param 1	Param 2	Param n
1	1	0	1/1/95	...	...	...
2	1	0	1/2/95	...	...	...
3	1	0	1/3/95	...	...	...
4	1	0	1/4/95	...	...	...
5	1	0	1/5/95	...	...	...
...
31	1	0	1/31/95	...	...	...
32	2	0	1/1/95	...	...	...
33	2	0	1/2/95	...	...	...

TISA processing procedure: Each region for all hours

SARB processing procedure: Each hour for all regions.

TSI FILE LAYOUT



SARB process procedure of TSI files

Hour	Regions 1 - 5282	Regions 5283 - 10564	Regions 10565 - 15846	Regions 15847 - 21128	Regions 21129 - 26410
0	File 1	File 9	File 17	File 25	File 33
3	File 2	File 10	File 18	File 26	File 34
6	File 3	File 11	File 19	File 27	File 35
9	File 4	File 12	File 20	File 28	File 36
12	File 5	File 13	File 21	File 29	File 37
15	File 6	File 14	File 22	File 30	File 38
18	File 7	File 15	File 23	File 31	File 39
21	File 8	File 16	File 24	File 32	File 40

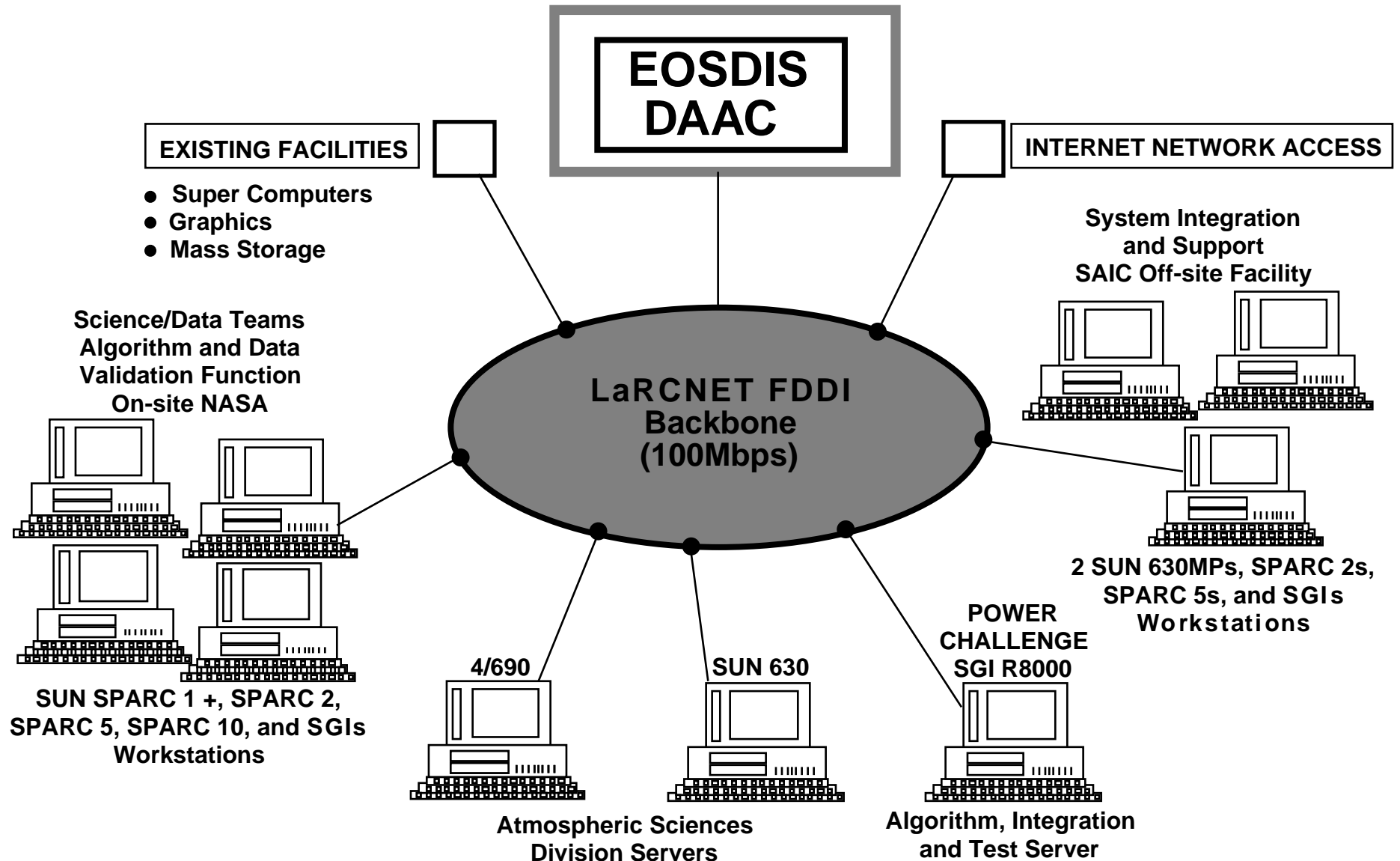
Methodology: Secondary Index File Technique

Secondary Index File Structure

Sec. Index Rec. No.	Reg.	Syn.Hr.	TSIFile Id	TSIRec. No.
1	1	0	1	1
2	1	3	2	1
3	1	6	3	1
4	1	9	4	1
5	1	12	5	1
6	1	15	6	1
7	1	18	7	1
8	1	21	8	1

Open/Close file Savings from: 248 hours x 144 (zone) files = 35,712 to: 248 x 5 = 1,240

SCIENCE COMPUTING FACILITY OVERVIEW



Facility Task Lead - C. E. Mackey

Science Computing Facilities

- **Upgraded the SGI Power Challenge XL server for algorithm development and testing**
 - Total of eight R8000 MIPS processors
 - Total of 2 Gigabytes of memory
 - Configured 81G of local disk space
 - Upgraded to IRIX 6.1
 - Installed SGI Fortran 90, but using NAG Fortran 90
 - Installed 32bit and 64 bit SDP Toolkit 5 using NAG Fortran 90 and SGI Fortran 90
 - Installed demo version of SGI Verdix Ada
 - Access to 120G jukebox is underway - evaluating software to drive the device.
 - Plan an additional staging device (possibly a tape stacker or an additional jukebox)
- **Plan to upgrade older Sun Sparcstation 1+ , two 330MP file servers and SUN IPC computers this fiscal year, moratorium permitting!**
- **Testing 120G tape stacker for workstation backups and data staging - still need management software which has been on hold for funding**
- **FY 95 Acquisitions**
 - 30 Weitek chips for Sparc 2 workstations (brings the cpu speed to a Sparc 10)
 - Added 4 CPUs, 1 GB of memory and 81G of disk space to Power Challenge XL
 - 2 Sparc 5 workstations
 - 2 SGI Indy workstations
 - 4 SGI Indigo 2 workstations

Validation and Visualization Aids

Develop tools for visualizing CERES data products to assist software development and support production processing and validation - understand the data and identify discrepancies

Tools and Current Status:

- **Multi-channel color strip charts for quick look at 'raw' data (OpenGL)**
 - **Processed one hour of CERES simulated SSF**
- **Latitude-longitude global plots for big picture initial look (NCAR graphics)**
- **FAST (Flow Analysis Software Toolkit - used in CFD community)**
 - **Modified to input CIA map database**
 - **2D projections (Mercator, Lambert Cylindrical, Orthographic, many others)**
 - **3D globe projection with interactive inspection**
 - **Modified to input CERES simulated SSF**

Near Term Development:

- **Develop GUI interface for visualization tools**
- **Develop interfaces for all archival and validation products**
- **Enhancements to FAST:**
 - **Input NAVY 59 ecosystem and elevation maps**
 - **Support for unstructured data (Cloud, SARB, & TISA gridded products)**

Non-EOS Ancillary Data Sets Required for CERES on TRMM

IRD Ref	CERES Field ID	AHWGP Field ID	Data Set	Source	Size/ Frequency
2	APD (Column)	CERX10	Aerosol global analyzed field (optical depth units)100km Analyzed Field File - global 1 deg map of total aerosol optical thickness	NOAA/NESDIS	1.4 Mb/week
3	APD (Strat)	CERX??	SAGE thin stratospheric aerosol optical depth	LARC DAAC	
4	OPD (Strat)	CERX??	SAGE stratospheric ozone	LARC DAAC	
5	OPD (Column)	CERX11	NESDIS Layer/Level Ozone - NOAA 14 POES SBUV/2 total ozone levels at 30, 10, 5, 2, 1, 0.4 hPa in mixing ratio (10*-3g/g) on NMC 65 by 65 polar stereographic grid for both hemispheres	NOAA/NESDIS	2 Mb/day
6	MWH	CERX13	SSM/I Integrated Water Vapor Daily -.5 by .5 deg lat/lon	MSFC DAAC	3.5 Mb/day
7	GAP(3-D)	CERX12	DAO gridded geopotential, wind speed, water vapor, layered atmospheric temperature; 6 hourly snapshots on 144 by 91 grid NCEP 28-level Sigma File	DAO GSFC or NCEP	821 Mb/mon 220 Mb/mon
8,9	GAP(Sfc)	CERX12	Surface skin temperature - 3 hour averages, globally on 144 by 91 grid / NCEP Flux File H2D	DAO GSFC or NCEP	550 Mb/mon 200 Mb/mon
11	CID_VIRS	CERX05	VIRS Cloud Imager Data	GSFC DAAC	
14 15	SURFMAP (snow) SURFMAP (ice)	CERX??	Snow/Ice Cover from DMSP SSM/I. Available every 6 hours; requesting 1 / day global data set; 48 km at 60 deg lat. 1 file / hemisphere for 2 (10,11) DMSP satellites	NOAA/NESDIS	42 Mb/day
16	SURFMAP(veg)	CERX??	Vegetation index from NOAA POES AVHRR. Plate Carree projection - 16km resolution. 75 deg N to 55 deg S	NOAA/NESDIS	2.3 Mb/week
17	GEO	CERX09	ISCCP B1 counts; 3 hourly	NOAA	200 Mb/day
1	MWP	CERX13	Microwave Liquid Water Path	DELETE	
10	CID_MODIS	CERX04	MODIS Cloud Imager Data	GSFC DAAC	
12	SURFMAP (DEM)		Digital Elevation Map	Toolkit	
13	SURFMAP (H2O)		Water Conditions	DELETE	

Estimated Size of Intermediate and Archival Data Products

Working Group	Subsystem	Total I/O Per Run, MB	Archived Per Run, MB	Runs per Data Month	Archived per Data Month, MB
Instrument	1.0 Geolocate and Calibration	1546	627	31	19437
ERBE-Like	2.0 Inversion to TOA	903	276	31	8550
	3.0 Averaging to Monthly TOA	676	574	1	574
Clouds	4.1 - 4.3 Cloud Property Retrieval	1016	14	744	10416
Inversion	4.4 Footprint Convolution	1006		744	
	4.5 - 4.6 TOA and SRB Estimation	678	324	744	241056
SARB	5.0 Surface and Atmospheric Fluxes	857	439	744	326616
	7.2 Synoptic Flux Computation	214	66	248	16368
	12.0 Regrid MOA Fields	32	30	744	22320
TISA	6.1 Hourly Fluxes and Clouds, Gridding	493		744	
	6.2 Hourly Fluxes and Clouds, Region Sort	12420	6210	1	6210
	7.1 Single/Mult Satellite Time Interpolation	6823	54	248	13392
	8.0 Regional, Zonal and Global Averages	802	733	1	733
	9.1 TOA and Surface Fluxes, Gridding	361		744	
	9.2 TOA and Surface Fluxes, Region Sort	6250	3125	1	3125
	10.0 Monthly and Regional TOA and SRB	4814	1129	1	1129
	11.0 Grid Geosynchronous Data	1466	524	1	524
Total		40357	14125	5772	670450

Estimated Source Code for each PGE

Working Group	SS	PGE	Source Code Lines	Number of Modules	Average Module
Instrument	1.0	Instrument	30000	50	600
ERBE-like	2.0	EINV	4200	40	105
	3.0	EDDBINT	330	9	37
	3.0	EDDBUPD	1200	21	57
	3.0	EDDBUER	580	11	53
	3.0	EDDBSRT	660	15	44
	3.0	EMTSA1	4000	60	67
	3.0	PREMTSA	1430	31	46
	3.0	EMTSA3	4000	60	67
	3.0	PRES4	540	12	45
	3.0	ES4	2870	48	60
	Total		19810	307	65
Clouds	4.1	Cloud Retrieval	27500	650	42
Inversion	4.4	Footprint Convolution	2500	53	47
	4.5	TOA/Surface Fluxes	7200	34	212
	Total		9700	87	111

Estimated Source Code for each PGE

Working Group	SS	PGE	Source Code Lines	Number of Modules	Average Module
SARB	5.0	Instantaneous SARB	1900	12	158
	7.2	Synoptic SARB	1950	40	49
		SARB Shared Routines	3550	5	710
	12.0	MOA Regridding	11550	36	321
	Total		18950	93	204
TISA	6.0	Atmospheric Gridding	6000	120	50
	7.1	Gen Solar Declination	460	7	66
	7.1	Interpolate Synoptic	11000	52	212
	7.1	Merge Satellites	8000	40	200
	8.0	Gen Weights & Flags	1500	5	300
	8.0	Synoptic Averaging	12400	59	210
	9.0	Surface Gridding	6000	150	40
	10.0	Regional Averaging	16900	76	222
	11.0	Grid Geostationary	6000	120	50
	Total		68260	629	109
System		CERESlib & Utilities	5000	50	100
System Total			179220	1866	96

System-Wide Release 2 Issues

Decide on final grid system (ripples everywhere)

Produce all archival data products in Hierarchical Data Format (HDF)

Finalize required metadata for every data product

Use mandatory PDPS Toolkit calls and test new Toolkit releases

Produce realistic measurements of computer system resource requirements

Define and implement QC reports: statistical summaries output from each PGE to convince us things are working or identify problems

Define Release 1 delivery as 'baseline' for configuration management. Objectives:

- Has the software been moved correctly from "thunder" to the DAAC.**
- Can the DAAC manage the monthly data volumes that the CERES software will produce?**

Release 2 Issues for Each Working Group

Instrument:

- **Planned Release 2 functions:**
 - Solar calibration processing
 - Diagnostic packet processing
- **Add coastline detection for geolocation validation**
- **Unplanned to account for instrument anomalies:**
 - 'Second time constant' unfiltering
 - Azimuth and elevation beam misalignment corrections

ERBE-Like:

- **Final CERES spectral correction coefficients**

Clouds:

- **Simulate all launch data sets and write input routines**
 - VIRS, MODIS, TMI, MWP, SSM/I, snow/ice surface maps,
- **Update current science algorithms with new releases**
- **Add in new science algorithms with input and output interfaces**
- **Input validation site lat/lon table, add val choice to input in process control file, add logic to capture pixels/footprints, and output to val file**
- **Update data product catalogs, Interface Requirements Doc for external ancillary data, design docs, user's guides, all other documentation**
- **Incorporate CERES PSF versus ERBE PSF.**

Release 2 Issues for Each Working Group

Inversion:

- **Re-design IES, SSF and CRS to remove redundancy and include needed items**
- **Access time-dependent surface emissivity maps**
- **Update SW and LW surface estimation algorithms as needed**

SARB:

- **Use the Fu-Liou model with revised correlated-k distributions to simulate the 8-12 micron window flux. (Operational)**
- **As strongly suggested by the Science Team, develop an algorithm that tunes the atmospheric fluxes to the estimated surface flux. (Operational)**
- **Develop a simulation of imager radiances (VIRS, MODIS, AVHRR). This is a research product for validation and quality control.**
- **Subsystem 12.0: The only expected changes for MOA are directly related to any changes in the input products. (likely an ongoing problem...)**

TISA:

- **Special averaging for 'weighted-column-averaged-cloud' properties**
- **Additional validation requests from Science Team**
- **Change ISCCP data from B3 to B1 and 'fall out' changes**
- **Add multiple satellite logic**
- **Include cubic spline averaging algorithm**

Subsystem Development Assessment

Working Group	Subsystem	Language	Risk	Comment
Instrument	1.0 Geolocate and Calibrate	Ada	Medium	Instrument challenges
ERBE-Like	2.0 Inversion to TOA 3.0 Averaging to Monthly TOA	F90	Low	Ready for Release 1 DAAC delivery
Clouds	4.1 Clear Sky and Cloud Detection 4.2 Cloud Layer Heights 4.3 Cloud Properties 4.4 Convolution with CERES Footprint	C & F90	High	Challenging data rates from imagers. Prototyping led to substantial progress.
Inversion	4.5 Inversion to Instantaneous TOA Fluxes 4.6 Estimation of Surface Radiation Budget	F90	Medium	Post-launch ADM development
SARB	5.0 Compute Surface and Atmospheric Fluxes 7.2 Synoptic Flux Computation 12.0 Regrid Humidity and Temperature Fields	F90	High	Intensive CPU usage, ancillary data.. Exciting new science
TISA	6.0 Hourly Gridded Single Satellite Fluxes and Clouds 7.1 Time Interpolation for Single and Multiple Satellites 8.0 Compute Regional, Zonal and Global Averages 9.0 Grid TOA and Surface Fluxes 10.0 Compute Monthly and Regional TOA and SRB Averages 11.0 Grid Geostationary Data	F90	Medium	Re-use ERBE heritage code. New team members still getting up to speed.

Meetings, Meetings, Meetings...

- **EOS/CERES Operations Workshop and IST demo at LaRC, April 6-7**
- **Pre Integration and Test Meeting at LaRC DAAC, April 11**
- **Science Software Integration and Test at GSFC, April 18-19**
- **DAAC Integration and Test Meeting at LaRC DAAC, May 2**
- **DAAC Integration and Test MOU Meeting at LaRC DAAC, May 25**
- **EOS/CERES Operations Meeting at LaRC, June 6**
- **EOS Mission Operations System Design/Prototype Results Review at GSFC, June 29-30**
- **Integration and Test Overview at LaRC DAAC, July 3**
- **IR-1 Readiness/Planning & Data processing design Meeting, July 5**
- **AM-1 Operations Workshop at GSFC, August 23-24**
- **EOSDIS CDR at Landover, August 14-17**
- **CERES Science Team Meeting at LaRC, September 20-22**
- **ECS Delta Detailed Design Review, September 27**
- **EOS Test Data / Integration Workshop at Hughes, October 11-12**
- **CERES Flight Readiness Review at LaRC, October 12**
- **EOS-AM Flight Operations Segment CDR at Landover, October 16-19**
- **ECS Incremental Design Review for Release B October 30-November 3**
- **Subsetting Special Interest Group Workshop at LaRC, November 8-9**
- **HDF discussion with National Center for Supercomputing Applications at SAIC, Nov 10**
- **Metadata discussion with Hughes ECS at LaRC , November 22**

Issues for Discussion

- **Potential TRMM launch date slip - six months?**
 - How hard should we push the team to meet 2/97 DAAC delivery for Release 2?
- **What is status of AM-1 deep-space calibration maneuver?**
- **Need a definitive schedule with specific testing dates for TRMM MOC/LaRC real-time interface**
- **What's impact of shift from TDRSS to ground stations for EOS-AM?**
 - Potential delivery delays and data loss
- **Need SDP Toolkit increase from 99 files to >744 files for monthly processing.**
- **Continue to have too many meetings - TRMM, EOS, EOSDIS, CERES**
 - The bleak outlook on travel budgets may take care of this problem for us